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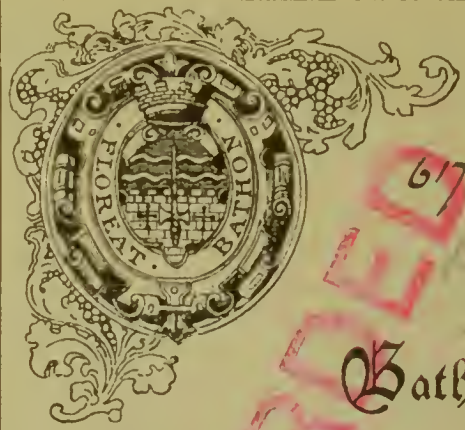

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International Health Exhibition,

LONDON, 1884.

ACCIDENTAL INJURIES

THEIR RELIEF

AND

IMMEDIATE TREATMENT.

How to prevent Accidents becoming more Serious.

BY

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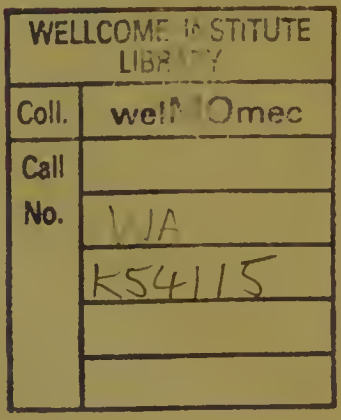

PREFACE.

THIS Handbook is intended as a guide, in simple language, from which the public may learn how to render efficient aid at the moment of injury. Not only are wounds, bruises and broken bones events of every-day occurrence, but a number of minor ailments, which might be relieved by the knowledge of some simple common-sense rules, are taken into consideration and dealt with in a popular and yet not in a superficial manner.

14, SUFFOLK STREET, PALL MALL,
LONDON, S.W., *June 18th*, 1884.

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ACCIDENTAL INJURIES.

EVERY ONE has within his or her recollection and experience, memories of accidents and injuries, some of greater, some of lesser severity. All must remember, at the time when some particular accident occurred, how bitter was the repentance of ignorance as to what was best to be done, and how earnest the wish that some means of telling what to do were at hand.

To prevent accidents occurring in our streets, factories, and mines, would be to teach people to take care and caution whilst crossing a street; to warn the worker that the sharp saw which revolves as he pleases may one day be his death; and to teach the miner to keep his safety-lamp shut. But not only is it in these more dangerous situations and occupations that care has to be exercised. In the house and the home the most simple things may become instruments of death: the kettle on the fire contains as certain a death to the child wandering near the fire-place as the most rank poison; the lap-dog may become rabid, and cause the torments of hydrophobia; whilst the bread-knife, or the pulling of a cork, may inflict as deadly a wound as a rifle bullet. To prevent accidents occurring lies within the province of the policeman, the local authorities, and the mother of every home; but as accidents will occur, it is expedient to know what to do to prevent them giving rise to more serious consequences still.

It is to this purpose, then, that this handbook is directed: it is to tell the bystander in simple language what to do to stop the flow of blood, to prevent a broken bone doing more

damage, to restore a person from a faint, and to render such assistance as will allay suffering and prevent more serious complications until such time as the doctor arrives.

It is objected to books and lectures of this sort that every one is being taught doctoring, and that "a little knowledge is a dangerous thing," &c., and such-like well-worn sayings. If to tell a mother how to save her child's life be teaching her doctoring, then the sooner she is taught the better. Again, it is not a little knowledge that is to be told you; it is complete of its kind, and there is nothing beyond it that is necessary for you to know upon the subjects dealt with, to enable you to render first aid to injured people correctly.

To the Ambulance Department of the Order of St. John of Jerusalem in England, not only has Great Britain, but the civilized world, to tender thanks and admiration for the introduction of the means of teaching "First Aid to the Injured." In the excellent syllabus published by that association will be found a guide to the nature of the accidents and every-day calamities most likely to be met with, and in the lectures given by the teachers co-operating with that association, the means of rendering first aid are taught both theoretically and practically. The regret is, not that every one is being taught the much-dreaded subject, "a little doctoring," but that such knowledge is not made at least morally if not legally compulsory.

Where freedom exists in such subjects, there will be found plenty of fools to take advantage of it; and just as amongst the seafaring population the knowledge of swimming is the exception, so much more common is it to meet with ignorance unworthy of the brutes in regard to the alleviation of the most ordinary of accidents.

It is difficult to know where to begin to teach such a subject so as to prevent it being merely *parrot-like*, known to-day and forgotten to-morrow; hence it is necessary to tell you something of the structure and functions of the body before launching out into details of how to proceed in cases of injury. You must know the machine before

you set to work upon it; you must know the economy before you begin to set it right. With this short apology I beg of you to bear with me whilst I go through a succinct account of such points in anatomy and physiology as you *must* know.

Now the best starting-point is

The Skeleton,

because it presents to us something fixed and, for the most part, appreciable to touch, even in the living body.

The best point to start from is the **Backbone**, or backbones as it should be called, owing to its numerous component elements. It also is called the spine, the spinal column, and the vertebral column. The latter term requires explanation. The name *vertebra* is given to each separate segment or bone of which the column is made up; hence the term vertebral column. The separate bones are not allowed to rub one against another, but are tied together by strong fibres and tissues, which at the same time form a pad or buffer to allow of compression and relaxation. This is known as the intervertebral substance, and the next skeleton you have the courage to look at, examine between the vertebræ, and you will observe that pieces of cork are inserted to represent the tissue of which we are speaking.

On looking a little more closely at the spine, you will observe that it increases in size from above, down. It is natural that it should do so, owing to the increase in weight which it has to bear as we progress downwards. The highest vertebræ, those of the neck, termed the *cervical*, support the head. Lower down we meet with the vertebræ of the back, or *dorsal* vertebræ, which, twelve in number, extend from the neck to the loins and support the twelve pairs of ribs. In the next region, that of the loin, we meet with the five *lumbar* vertebræ, they being the only bones met with in the region.

The vertebral column now ends off in two solid pieces of

bone, the *sacrum* and *coccyx*, which have the appearance of having been originally separate pieces of bone, but now grown together. They are both concerned in the forma-

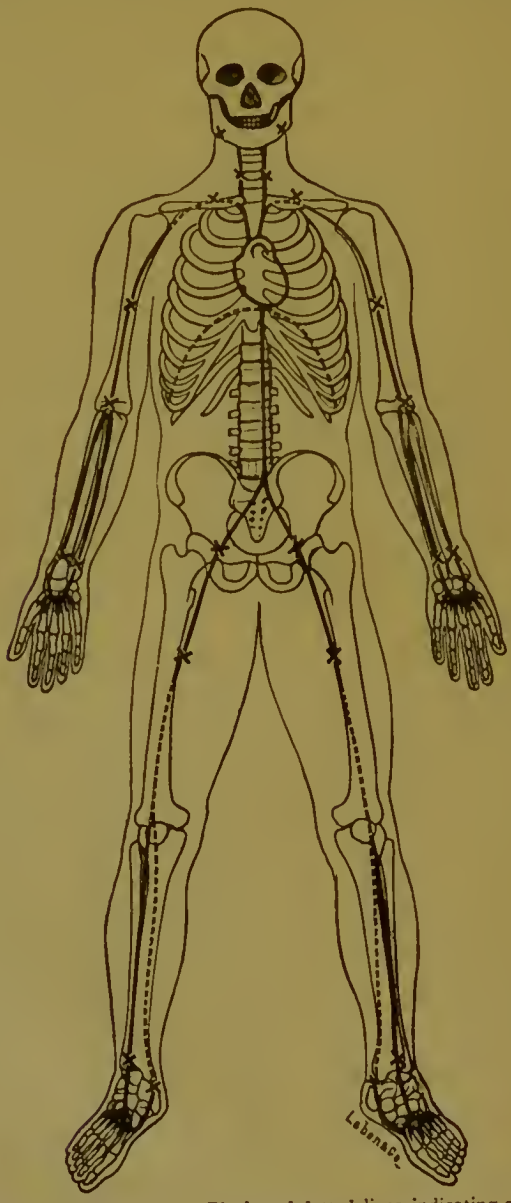

FIG. 1—Shewing: 1. The skeleton. 2. Black and dotted lines indicating course of arteries. 3. X X showing where compression may be applied.

tion of the large girdle of bone met with at the lowest part of the trunk under the name of the Haunch-bone,

or PELVIS, which receives the weight of the body, and hands it over to the lower extremities. This large girdle is composed, not of a solid continuous piece of bone, but of two halves, separated in front by only a small piece of gristle or cartilage. Behind, however, a wide gap exists between them, and into this gap is fitted the lowest two pieces of the vertebral column, the sacrum and coccyx; all four parts are lashed together by the strongest bands or ligaments met with in the body.

It will be seen that in the coccyx the vertebral column tapers off into a point below, and in animals which possess a tail this is the bone which by its prolongation forms it. On either side of the pelvis, or haunch-bone, a large pit is dug out for the reception of the head of the thigh-bone, and it is here that we first meet with a true joint, in the form of the hip-joint.

A joint may be described as the spot where two bones meet. Over the surfaces of the bones, so as to prevent friction, is a covering of gristle or cartilage. Anointing the joint is a quantity of fluid, "joint-oil," or *synovia*, enclosed in a membrane to prevent its escape. Tying the bones together, so as to restrain the motions of the joint, are a number of bands or ligaments. Briefly, therefore, a joint consists of bones, cartilage, synovial membrane, and ligaments.

Beyond the hip-joint is the **Thigh-bone,** or FEMUR, which, being the only bone met with in the thigh, shows clearly when broken all the signs of fracture. Its upper end consists of a head, supported by a neck, which projects at an angle from the shaft; it is the neck which is so frequently broken, especially in old people. The shaft of the bone, a long thick cylinder, ends below at the knee as two stout knuckles or condyles, which form the upper part of the knee-joint.

The Knee-joint consists of three bones—the thigh-bone, or *femur*, above; the knee-cap, or *patella*, in front; and the shin-bone, or *tibia*, below. This is a huge joint, and is composed of bones, cartilage, ligaments, and synovial membrane, as already described. The knee-joint is an

enormous size, being four times larger than any other joint in the body. Its extent and its proximity to the skin render it apt to get injured, and serious consequences ensue unless care is taken that even slight injuries near the joint are speedily and strictly attended to; otherwise, should inflammation occur in the wound, the joint itself may become inflamed, and there is no knowing where that may end; probably with either a stiff knee, or loss of limb, or loss of life. A knee-joint once weakened can always be felt afterwards; and thirty years afterwards, when the east wind blows, or on a sudden straightening of the limb, "the old hurt" will assert itself by a sudden twinge in the joint.

Beyond the knee we come to the leg, and I beg of you to note carefully the names of the different regions of the lower extremity. They are the *hip*, *hip-joint*, *thigh*, *knee-joint*, *leg*, *ankle-joint*, and *foot*. The leg, then, is only the portion between the knee and the ankle, and the name *lower extremity* is given to the whole limb.

The Leg consists of two bones—the larger one the SHIN-BONE, or TIBIA, on the inner side, and close below the skin; the smaller one the SPLINT-BONE, or FIBULA, on the outer side, and deeply sunk amongst the muscles of the calf of the leg. The tibia is named from its likeness to the old Roman musical instrument of that name, and the fibula from its likeness in position to the clasp of a brooch. These bones are frequently both broken, but the fibula just above the ankle is the bone most frequently broken in the lower extremity. The tibia upon the inside, and the fibula on the outer side, both present below two stout tongues or projections of bones, which serve to embrace the first bone of the foot, the whole constituting the ankle-joint.

The Ankle-joint is made up of the shin-bone or tibia above, the first bone of the foot (the astragalus) below, and on either side the two tongues spoken of (beneath either elastic of the boot, the inner from the tibia, the outer from the fibula), which embrace the astragalus and complete the ankle-joint. Seeing that the structures of a joint are fresh in our memories, we may here discuss :—

A Sprain.—By a sprain is meant a twist, strain or rick occurring at a joint, and of such severity as to cause, it may be, serious trouble. The ankle, the most frequently sprained joint, is especially liable to wrenches and twists from slipping, on a smooth floor, or down stairs, or on a piece of orange-peel and the like on the pavement, or treading on the edge of a fair-sized stone, or putting the foot into a hole on uneven ground, or simply from the tendency "to go over" the ankle.

When from any of these causes a sprained ankle results, what happens is this:—The sudden wrench started the bones from each other for an instant, and during that instant various things occurred. The bands or ligaments which hold the bones of the joint together were suddenly stretched, torn, and made to bleed, the gap which occurred between the bones sucked the blood into the joint, so that the joint instantly swells. Before even the stocking and shoe can be got off, the joint has swollen. Nothing could accumulate at such a rate except blood; and if further proof is wanted, it will be found two or three days afterwards by the skin becoming discoloured "black and blue" when the blood comes to the surface. *To relieve pain* in such an accident, and to prevent more serious trouble, the joint should be kept quiet, and the use of it prevented. To take the pain and sting out of it, the foot and ankle should be placed in hot water (100° F.), if it can be obtained. If the accident occur on a country road, the ankle should be bound round tightly with a handkerchief, either dry or dipped in cold water, or in equal parts of whisky or brandy and water, the stocking pulled over it, and the boot tightly laced; or, without removing the boot, tie a handkerchief tightly over all. If the cold or spirit lotion is agreeable, re-apply it; but if the pain is great, place the ankle in hot water, or apply a hot fomentation, *i.e.* a flannel wrung out of hot water, or a bran poultice with a tablespoonful of vinegar or arnica lotion, or both, over the poultice. In all cases a medical practitioner should examine the joint as soon as possible, as to all but the

skilled, what looks like a mere sprain may be a broken bone.

Beyond the ankle-joint is **the Foot**. Seeing the pressure, at times very sudden, which the foot has to bear, the necessity for a number of small bones in the foot instead of one large bone is readily understood (Fig. 1). A single bone would be apt to get broken, whereas a number of small bones distribute the shock, and lessen it by handing the pressure over from one to another. The first part of the foot proper is called the *tarsus*, consisting of seven bones, one of which forms the heel, and another (the astragalus) forms the lower part of the ankle-joint. In front of the tarsus are the five bones supporting the five toes; they are called *metatarsal*, meaning that they are in front of the tarsus. Finally we have the bones constituting the toes, and going by the name of the *phalanges*, from the fact of the bones being arranged in rows, or like soldiers in a phalanx. The foot has two surfaces—an upper, or back or *dorsum* of the foot; and an under surface, or sole, or *plantar* aspect of the foot. The human being plants his whole foot upon the ground, differing from a dog, ox, or horse, as these walk on their toes; what you call a horse's hind knee, or more technically hock, really corresponds to our ankle, although it is placed almost half-way up the animal's limb.

In this sketch, then, of so much of the bony skeleton, we have seen how the weight of the head was supported by the neck or cervical vertebræ; how that, owing to the increase of weight, from the necessity of supporting the upper limbs, the vertebræ of the back or the dorsal vertebræ became larger, and that the lumbar or loin vertebræ, having the whole of the upper part of the body to support, were huge. It was also pointed out that, at the haunch-bone, or pelvis, the weight divided and passed across the hip-joint to the thigh-bone or femur, from thence across the knee-joint to the shin-bone or tibia, which, along with the small bone or fibula, make up the leg; and that, finally crossing the ankle-joint, the weight was received by the tarsus and handed over therefrom to the sole of the

foot generally. Whilst tracing the weight and the bones which sustain it on the way down, however, it is evident numerous parts have been omitted ; they are the ribs and sternum, the upper limbs and the skull.

The Ribs, or *costæ*, number twelve pairs, exactly the same in men and women, although most have heard of the belief, got from concrete creative notions, that man has one fewer than woman. The upper seven ribs run from the backbone behind to join in front with the **Breastbone,** or *sternum ;* these are called the *true ribs.* The remaining five, which fall short of the breastbone, go by the name of the *false ribs*, of which the lowest two, being free in front, are called the *floating or winged ribs.* The breastbone, or sternum, runs from the root of the neck down to the pit of the stomach.

Enclosed within the ribs are the various organs met with in the chest and upper part of the belly, and it becomes necessary to shortly indicate the positions of the large organs of the body.

The trunk of the body is portioned off by a large muscular partition, the **Midriff** or DIAPHRAGM, which completely divides the trunk into two parts ; the part above it is called the chest, or THORAX, and the part below it the belly, or ABDOMEN. The thorax has bony walls, the ribs bounding it ; but the abdomen is soft-walled, and capable of being easily compressed. The organs contained within the abdomen encroach upon the thorax, so that the ribs give protection to many of the abdominal as well as the thoracic organs, or viscera. This is allowed for by the shape of the diaphragm, which, arching up towards the thorax, as the dotted line shows on figure 1, accommodates the *stomach*, *liver*, *spleen*, *pancreas*, and the upper end of the *kidneys* on its under surface.

The Chest, or THORAX, is bounded behind by the vertebral column, on either side by the ribs, and in front by the breastbone, or sternum. The upper end is at the root of the neck, the lower limit is the midriff, or diaphragm. Its chief contents are the *heart* and the *lungs*.

THE HEART, safely ensconced between the two lungs, rests upon the top of the diaphragm, midway between the backbone and breastbone ; it is about the size of the clenched fist of the person it belongs to, whereas each lung is as big as the person's head. Huge things these LUNGS are, reaching from the neck, even above the collarbone, down to the midriff, or diaphragm, and filling the whole area of the chest—front, back and sides. There can be no difficulty in being able to tell where the lungs are, because everywhere where a rib can be felt there is the lung beneath—not far off, but absolutely in contact, so that should a rib get broken, there is danger to the lung on account of the close proximity of the one to the other. The circulation and respiration will be described further on ; in the meantime, allow the brief indication of the position of the heart and lungs to suffice.

In the **Abdomen** the organs met with occupy the following positions. THE STOMACH is beneath the region called the "pit of the stomach." THE LIVER lies on the right side. It is a large solid organ as big as the brain, and it pushes up the diaphragm so as to ensconce itself under the cover and protection of the ribs. The position of the liver on the right side may help in the explanation of the use of the right hand ; this heavy organ, 50 oz. in weight, placed near the middle of the body, must have some influence upon the rotation of our bodies. However it may be as to the use of the right hand, the fact may help the memory that the liver is on the same side as the right hand, and that pain in the right shoulder may mean disease of the liver.

The SPLEEN is placed on the left side in a line with the stomach, and wholly protected by the ribs. It is almost the size of the palm of the hand, solid in structure, and containing a large quantity of blood. Both the liver and the spleen are apt to get ruptured by blows, but more especially when the lower ribs are broken on the right or left side, so may the liver or spleen respectively get damaged.

The positions of the other organs are easily under-

stood. Every one knows that the kidneys are behind in the region of the loin, that the intestines occupy the chief part of the front of the abdomen, and that within the pelvis lie organs of excretion and reproduction. This must suffice for the position of the organs of the body, and now there remains the upper extremity and the skull.

The Upper Extremity includes the parts known of under the names of the *shoulder*, the *shoulder-joint*, the *arm*, the *elbow*, the *forearm*, *wrist* and *hand*.

The Shoulder is the mass moved when one shrugs the shoulders, when it feels as though half the body was moving. This is owing to the large expanse of the *blade-bone* or *scapula*, and the mass of muscles connected with it. The only other bone met with is the **Collarbone** or CLAVICLE, a narrow rod-like bone, which can be felt as it passes from the top of the breastbone, or sternum, out to the top of the shoulder, where it meets a process of the blade-bone, or scapula, and completes the summit of the shoulder. When these two bones have to sustain severe pressure, as by a fall on the hand or elbow, the collarbone has the full weight to bear, and as it is fixed between two bones it gets snapped and broken, in spite of its S-shaped curve. The curve upon this bone brings the fact home to us, that bones are not stiff and brittle things that snap like a stick of chalk or a piece of dry twig, but behave rather like a piece of green twig, which, whilst it bends easily enough, requires a deal of twisting, twining and wriggling before the two parts can be got asunder. Bones, also, especially in the young, but less so in the elderly, will stand a deal of bending before they break, and this is especially the case with the clavicle, which with its double curve is doubly provided with a power of resistance to fracture from falls on the hand, elbow, or shoulder whilst the child is learning to walk.

The Bladebone, or SCAPULA, on the other hand, is a movable bone, and can, when pressure is exercised on it, move out of the way and save itself; hence, except direct violence be aimed at it, no fracture is likely to ensue. Beyond the shoulder is **the Shoulder-joint**, a joint provided with a

wonderful facility of motion, and capable of the most varied movements. This is allowed for by the shape and condition of the bones forming it; they are the rounded head of the bone of the arm, the humerus, and the shallow, saucer-like (or glenoid) cavity on the scapula. The cavity is so shallow and small that it does not in any way interfere with the free movements. In this way, then, is it that the shoulder-joint and hip-joints differ, for it is plain they are both situated at the top of the part where the limbs sprout from the trunk, and upon their looseness or fixity will depend the extent of motion with which the whole limb is endowed.

The hip-joint, we saw previously, possesses a cup-shaped cavity, but we find that the shoulder-joint is like a saucer. The head of the thigh-bone is round like a ball, so is the head of the humerus. Now a ball placed in a cup has but little free motion, but on a saucer it can roll about at freedom. But here arises also the source of danger: the shallow saucer may allow the ball to roll over the edge, whereas in the cup it is well-nigh impossible; similarly, the saucer-like depression at the shoulder-joint may allow the round humerus to slip over the edge, constituting a dislocation, whilst in the case of the hip the cup-like cavity will restrain the head of the femur and prevent dislocation. Hence it comes about that dislocation, *i.e.* the bones slipping out of their sockets, is very common at the shoulder-joint, in fact, ten times more common than all the other dislocations in the body put together.

By a Dislocation is meant the slipping from off each other of the surfaces of the bones constituting a joint; by a *compound dislocation* is meant a simple dislocation compounded with an injury to the tissues and skin over the joint, in fact, the ends of the bones may protrude through the skin. Seeing that the joint we have just been speaking of—the shoulder-joint—is the most frequent seat of dislocation, it will be well here to dwell upon dislocation for a time. The causes of dislocations are chiefly falls in some position which, catching the joint at a disadvantage, causes the ligaments around it to give way and the bones to slip

Thus the shoulder is most frequently put out by a fall on the hand or elbow. The elbow, the second most commonly dislocated joint, is also put out by a fall on the hand when the forearm is bent on the arm. A fall from a horse is a common cause of dislocation of the shoulder, hence it is a common hunting-field accident; a backward throw, and the person trying to save himself by putting his hands out behind him, is also a likely position in which to dislocate the shoulder; hence it is common in the foot-ball field, in boxing, and in some forms of wrestling.

The way to tell when a shoulder or other joint is out, *i.e.* dislocated, is:—

1. The person in whom it has occurred, the patient we shall say, feels something has given way.

2. The pain is severe, of a sickening, numbing, wrenching character.

3. The joint is immovable, and attempts at motion elicit severe pain.

4. The part when actually *seen* will be found to be deformed as compared with the joint of the limb on the sound side.

5. The deformity of the parts may be actually *felt*.

6. The change of shape occurs at a joint, and not in the continuity or course of a bone.

TO PREVENT this accident becoming more serious and to allay the patient's suffering, get the limb in as easy a position as possible. If it is in the house, lay the patient on a couch or bed in the position of repose, and place a pillow below the injured limb in the position which is most easy. Slit up the seam of the coat or trousers when the patient is made comfortable, and get the coat and all clothing removed or made easy around the joint. Send for the doctor, but meantime you may apply cold water rags, or a lotion of half spirits (whisky, brandy, gin, spirits of wine) and water, or sal-volatile a drachm (*i.e.* a teaspoonful), to an ounce (*i.e.* two tablespoonfuls) of water. If heat is more agreeable, apply a hot fomentation, *i.e.* a flannel wrung out of hot water, and if it is pleasant to the patient, repeat it

frequently. Should the accident have occurred in the hunting or foot-ball field, or anywhere away from house or home, then the seam of the coat should be slit up, the limb fixed to the side in the most easy position possible; this is done by means of a sling or support (see page 48). If the under-clothing is felt to be pressing, slit up the seam or cut the linen or under-vest, undo the brace on that side, and give the patient a mouthful of water, whisky and water, brandy and water, cold tea, or whatever else of the kind may be at hand. If the patient is near home, take him home; if far from home, with, say a long drive, a ride, or a journey by train, then the nearest doctor ought to be sent for, and one should not yield to the solicitations of the patient who insists that he will be all right when he gets home, or that he wishes "his own doctor" to see it, and what not. Every medical man is capable of reducing a recently dislocated shoulder-joint with or without the aid of chloroform and assistants, and it is only inflicting unnecessary pain to defer the reduction until the patient gets home. He can go home soon after it has been reduced, but it is cruelty to send him twenty miles on a railway journey home from a foot-ball match with an unreduced dislocation. Let none but a medical man attempt to reduce dislocations of the large joints such as the shoulder or elbow. It seems hard to let the patient lie suffering until the medical man comes, but nothing but repentance will follow active interference, and that friend will perform the greatest kindness to the patient who places the limb in the easiest position possible and prevents further interference until the doctor arrives.

A man who has had his shoulder-joint dislocated, will frequently know what to do to rectify the displacement, and will either pull it in himself or tell a bystander what to do.

We have dwelt so long on dislocations that it well-nigh slipped from the memory that we have left the description of the upper limb still unfinished. Well,

The Arm is the name of the section of the limb beyond the shoulder-joint, and in it we have, as in the thigh, only

one bone—the HUMERUS. Its upper end is rounded to form the ball met with at the shoulder, whilst its lower end is broadened so as to give surfaces for the two bones of the forearm to be supported upon.

The Elbow-joint is made up of the arm-bone, the humerus, above; and the two bones of the forearm below. The bones forming it are liable to dislocations and fractures; it is close to the skin, hence any unskilled person attempting anything more than simple measures may do much harm (see p. 13).

In **the Forearm,** as in the leg, there are two bones, but, unlike the leg, the bones of the forearm are nearly of a size; the inside bone, that is, the little-finger-side bone, is called the ULNA; the outside bone, that is, the thumb-side bone, is called the RADIUS, because it twists or rotates or radiates round its fellow. Now between these two bones a motion peculiar to the forearm takes place. To demonstrate this, with the forefinger and thumb of the right hand grasp the bone felt on the little-finger-side of the left forearm, just above the wrist; the bone so grasped is the lower end of the left ulna; now it will be found possible to move the left hand so that now its palm is upwards, now its back, and it is plain that this motion is a motion of the outside or thumb-side bone—the radius, on the inside bone—the ulna. It is observed that the hand moves with the radius, and that it alone supports the hand, so that a fall upon the hand may cause fracture, through the stress thrown on this its supporting bone. The motions so essential to the utility of the human hand, which have been pointed out, are called supination and pronation—*supination* when the palm of the hand is upwards or forwards and the thumb outwards; *pronation* when the palm of the hand looks downwards towards the ground, or backwards, and the thumb inwards towards the body.

These movements have to be carefully preserved when any accident happens to the forearm threatening rigidity.

Beyond the forearm comes the wrist-joint, made up of the forearm bones above, and the first row of the bones of the wrist below.

The Wrist, or CARPUS, is composed of eight small bones in two rows, four in each row. Two lines on the skin in front of the wrist, frequently met with, mark the position of the rows of bones. Beyond the carpus are the five bones supporting the five fingers, and on these bones the front or palm, and the back or dorsum of the hand are placed; they are called the *metacarpal* bones, and they form the knuckles. **The Fingers** are made up, with the exception of the thumb, of three bones called *phalanges*, from being arranged like soldiers in a phalanx; and they are named, commencing from the knuckles, the first, second, and third phalanges, respectively. The thumb, like the big toe, has only two phalanges.

Last of all in the bony skeleton we have to discuss the skull.

The Skull comprehends the brain case or *cranium*, and the *face*. It is balanced on the top of the backbone, the uppermost vertebra of the neck forming a joint with it, at which the nodding motion of the head takes place. The lower limit of the cranium, and consequently of the brain, can be made out by taking a line on either side forwards from where the hair joins the skin of the neck behind, through the middle of the ear, and forwards to the eyebrow. All above this line contains brain.

THE CRANIUM is about a quarter of an inch in thickness, and has the brain in contact with it; hence any injury to the bone will almost of necessity injure the soft brain-mass within. The bones forming the cranium are so fitted by toothed edges into each other that they cannot be displaced; they are named according to their position, *frontal* forming the forehead bone, the *temporal* containing the ear bones, and so on.

Below the cranium is THE FACE, composed of bones arranged to form the nose, orbit, cheek, and mouth. The only movable bone of the face is the lower jaw or *inferior maxilla*, named so in contradistinction to the *superior maxilla* or upper jawbone; the joint lies in front of the ear, and the bone can be felt to move when you place the finger on the skin immediately in front of the lappet of the

ear. This joint may get dislocated, when the mouth will be found gaping, and all attempts at closure will prove ineffectual until reduction is performed. This can only be done by skilled hands, so it must be left to a medical practitioner.

MUSCLES.

Every motion in the body takes place by muscles, be it the blow of a pugilist, the act of frowning, or the glib motions of the tongue. Hence muscles are almost everywhere, and they make up with the bones the mass of our limbs. It is difficult to believe, when first told, that muscle and flesh are the same tissue, but such is the case. What you recognise as flesh, are muscles of either a young animal or one in which much fat has accumulated in the substance of the muscle; what you recognise as muscle are muscles of an old animal, or one which has had to exercise them much in the search of food. Flesh, then, is muscle with fat incorporated in its tissue.

Peculiar to muscular elements is the property of contraction, and it is this property that renders muscle the all-important factor in motion. Every one is familiar with muscular contraction. To illustrate it, let the reader place the right hand over the front of the left arm midway between the shoulder and the elbow ; now bend the elbow, *i.e.* bring the forearm up to the arm. Whilst this is taking place, a hard swelling rises up beneath the right hand, which most people know to be a muscle called the biceps. The cause of its swelling up is that the muscular elements have re-arranged themselves so that the muscle becomes a hard ball, and the effect produced by its swelling up is the motion of the forearm.

The muscles in the limb are thick and fleshy in the middle of their course, but at the spot where they cross joints they form for the most part hard, dense, fibrous bands called *tendons*. These go popularly by the name of "leaders ;" and at the wrist, where we hear of leaders being so frequently strained, we can feel numbers of these

hard cords. In the walls of various organs, such as the stomach, heart, intestine, gullet, lung and bladder, we meet with muscular structures which are not under the direct command of the brain; these go by the name of the *involuntary muscles.* They are regulated by a separate set of nerves (see Nervous System), are at work during sleep, and in appearance and behaviour are totally different from the voluntary muscles or flesh of the body. The mention just made of two sets of nerves brings us to consider—

The Nervous System.

The muscles of our limbs, and all our senses, are under the control of the system of nerves called the cerebro-spinal. This consists of the **Brain,** or *cerebrum,* resident in the brain-case, or cranium, and the prolongation from it that goes down the spine, under the name of the pith, or *spinal cord.* From the brain and spinal cord nerves pass to the muscles, carrying impulses to move; they are called *motor* nerves; but there is also an upward current carrying messages from the skin and sense organs to the brain; these nerves are called *sensory* nerves.

Fig. 2.—Showing the Brain, consisting of cerebrum in light, and cerebellum in darker outline. The long perpendicular line is intended for the spinal cord. The lines joining it, the motor and sensory roots of the spinal nerves. The black dots are the ganglia of the sympathetic system in front of the cord.

The two sets of impulse are conveyed along separate fibres which are firmly bound together; but close to the spinal cord the fibres separate, and we see a motor and sensory bundle (see Fig. 2).

The involuntary muscles of the body are under the regulation of a separate system of nerves, which, as it presides over the organs of the more animal or vegetative part of our existence, is called the vegetative or *sympathetic system.* This consists of a double chain of small

nervous masses, called ganglia, united together by nerves. The chains are arranged on either side of the spine. From the ganglia, nerves pass to the heart, lungs, and the organs of the alimentary canal, liver, pancreas, &c.

Hence we find that we have two sets of muscles presided over, in the main, by two sets of nerves; the voluntary muscles by the cerebro-spinal system, and the involuntary by the sympathetic. The chief difference between the two sets is that one, the sympathetic system, acting on the heart, lungs, and digestive system, continues in action from the birth to the death of the individual, knowing neither rest nor stoppage, as we understand rest; whilst the other, the cerebro-spinal system, presiding over the voluntary muscles, requires long intervals of quietude, provided for by sleep.

We have absolute command, then, of the one set, but not of the other: we can lay our pens down when we like, but we cannot stop our heart's beat; we can push away the tempting fluid, but cannot prevent its absorption, or stay its digestion, when once it is swallowed.

THE CIRCULATION OF THE BLOOD.

The position of the heart and lungs was discussed at page 10.

To understand the course of the blood, look at the back of your hand, and you will see blue vessels (**veins**) immediately beneath the skin. You may be able to follow one of these up the forearm to the elbow, where, in front, two large veins are found. Grasp now the arm above the elbow, and you will find that the veins stand out more prominently. What does this teach you? It teaches you that the blood in the veins is passing from the fingers up the arm towards the root of the neck, and so on to the heart. In the lower extremities, the veins carry the blood from the toes up the leg and thigh, and finally through the body to the heart. All the blood contained in the veins comes, then, to the heart. The blood contained in them is dark purple waste or venous blood that has been used by the

tissues, and is on its way back to the heart. It there passes (Fig. 3) into (1) the first chamber of the heart (the *right auricle*), and is driven thence, by muscular contraction, into (2) the second chamber (the *right ventricle*). This in turn contracts and sends the blood to the lungs by a large vessel called the *pulmonary artery*. In the lungs the blood is exposed to the oxygen in the air we breathe, and a magical effect is produced. The blood becomes scarlet in colour, purified, as it is termed, and is now ready to go through the body, carrying oxygen to the tissues. It does not, however, go straight from the lungs to the body, but is first collected by vessels called *pulmonary veins*, and is carried back to

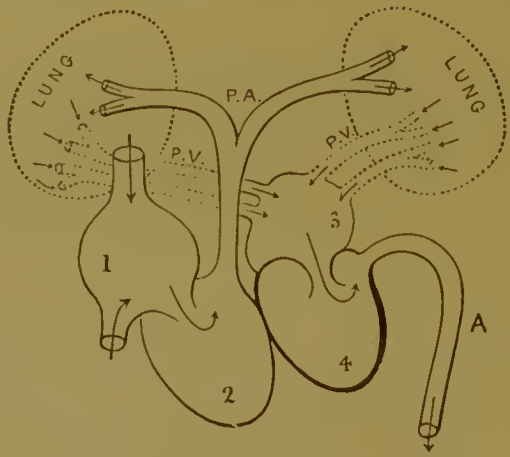

FIG. 3.—Diagram of circulation of blood. 1. Right auricle. 2. Right ventricle. 3. Left auricle. 4. Left ventricle. P. A. Pulmonary artery. P. V. Pulmonary veins. A. Aorta. Commence at cavity 1 and follow the arrows out of cavity 4.

the heart, first to (3) the *left auricle*, or third chamber, hence to (4) the *left ventricle*, or fourth chamber, and finally leaves the heart by a large artery called the *aorta*. It will be observed that the two right cavities contain venous blood, and that the two left cavities contain scarlet, or arterial blood. The aorta is the great arterial stem, arising from the left ventricle, which gives off branches (arteries) to all parts of the body, carrying pure blood to the tissues. Each muscular contraction of the left ventricle sends the blood with an impulse into the arteries, causing the increase in pressure we call *the pulse;* and a pulse exists

in the course of the arteries everywhere in the body. The number of times the pulse beats tells us the number of times our heart contracts, because the one is caused by the other. Hence if we feel the pulse at the wrist, and it beats, say, seventy-two to the minute, we know that the heart beats, or contracts, likewise seventy-two times a minute. To find the pulse at the wrist, place the forefinger on a spot an inch above the wrist, and half an inch internal to the thumb-side of the forearm. Arteries can be felt in many other places; for instance, place your forefinger immediately in front of the lappet that projects in front of the ear-opening, and you there feel an artery, the temporal, beat. Now, the quicker the heart beats, the quicker the pulse, and *vice versâ*.

By the aid of a microscope, fine, hair-like tubes, called **capillaries**, are to be seen in all parts of the body. These minute vessels are everywhere: one large muscle may contain millions; they are the spots at which the interchange of fluid and gaseous nutrition takes place, as evinced by the change produced on the colour and character of the blood. The blood *enters* the area of capillaries from an artery as pure, oxygenated, scarlet, or arterial blood, and *emerges* in a vein as impure, dark purple, or venous blood, having lost part of its oxygen and being charged with carbonic acid. The carbonic acid is now conveyed away to the lungs in the venous blood; and in the lungs the blood gives up part of the carbonic acid during expiration, and receives oxygen from the air during inspiration.

RESPIRATION.

Respiration, or breathing, is carried on by the lungs, or "lights," as they are popularly called. The position of the heart and lungs was given at p. 10. The air enters by the nose or mouth, passes to the back of the throat, hence through the larynx, or "apple in the throat," down the windpipe, and then through the bronchial tubes into the lungs.

The air around us consists, for the most part, of oxygen and nitrogen The oxygen constitutes about one-fifth part

of the atmosphere, and is the active element in maintaining life. The nitrogen, however, we inhale as well, but it is passive in its action, serving simply as a diluent.

The process of breathing consists of two steps: the taking in—*inhalation*, and the letting out—*exhalation*. What is inhaled, is air; what are exhaled, are various products from the venous blood. What are these?

1. Water. Breathe on a glass for a time, and it will be found to become dim, and by and by drip with moisture; or when the temperature is low, as on a frosty morning, one can "see" one's breath; this is owing to the rapid condensation of the aqueous vapour in the breath, from its contact with cold air.

2. Heat. When our fingers are cold we involuntarily put them to our mouths and breathe upon them to warm them; hence we loose heat by our breath.

3. Carbonic acid gas. When one sits in a room with doors and windows shut and no fire, the room gets stuffy or close; this is from the pressure of carbonic acid gas escaping from our lungs.

A simple experiment proves this. Put some lime-water in a tumbler, and breathe into it through a glass tube; the lime-water becomes milky white: the lime and the carbonic acid gas have united to form chalk. Hence during exhalation we lose moisture, heat, and carbonic acid gas.

The process of inhalation is chiefly a muscular, that of exhalation a mechanical act. We breathe at the rate of from fifteen to eighteen times per minute.

The Blood-vessels, and Arrest of Bleeding.

The blood, leaving the heart by the **Aorta**, is carried down the front of the backbone, and passes through the midriff, or diaphragm, to reach the abdomen. Its first portion is shaped like the handle of a staff or shepherd's crook, and is called the *arch of the aorta*. It is not a smooth-handled staff, for it is seen that three great twigs or branches come off from it and pass up to the head, neck,

and upper extremity. The first great vessel is the *innominate* (see diagram); it passes upwards to divide into the *right common carotid* and *right subclavian*, which respectively go to the neck and upper extremity. The second great vessel is the *left common carotid*, and the third is the *left subclavian*. So that the vessels, although not at first symmetrical, come after the innominate divides to resemble each other. Following the handle of the staff downwards through the thorax and abdomen, where it is called respectively the *thoracic* and *abdominal aorta*, it is found about halfway down the abdomen to divide into two branches. The large original trunks from the aorta, called the *common iliacs*, divide into two, called *the internal and external iliac* arteries (see diag., pp. 4, 32.) One, the internal, drops down inside the pelvis and supplies all the organs there, bladder, &c.; whilst the other, the external iliac, passes downwards to the top of the thigh and there enters the lower limb exactly in the centre of the top of the thigh, *i.e.* the fold of the groin. Here, then, a large artery as big as the little finger enters the thigh, and we must consider for a moment **the characters of an artery.**

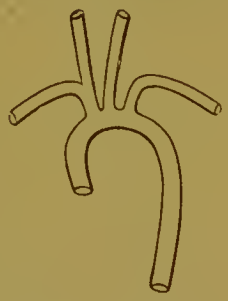

FIG. 4.—Arch of aorta giving off from left to right of diagram. (1) innominate artery, dividing into right subclavian and right common carotid; (2) the left common carotid; (3) the left subclavian artery.

We know an artery carries pure blood, as it is called, from the heart to the different parts of the body, hence the stream is from the heart towards the extremities; in the particular vessels we are now concerned with, it is flowing down towards the feet. The blood is also *scarlet*, not red, but scarlet in colour, as is the case with all arteries. When one gets the finger upon an artery it can be felt to beat or pulsate, and this is the case not only "at the pulse" at the wrist, where we speak of "the pulse" as if there were no other in the body, but wherever one can compress a fair-sized artery against a bone.

There are certain definite bony points against which arteries may be compressed with ease and advantage

and it is these points I want to elucidate and bring clearly home to you. Now you must know first something about

The Course of the Arteries in the Lower Limb

The Artery of the Thigh is termed the *femoral* artery, but there is no necessity for your remembering the technical name; the artery of the thigh every one understands, so call it that. Entering the thigh in front, in the middle of the fold of the groin, it passes downwards, towards the inner side of the knee (see diag., pp. 4, 32). The position of the artery is exactly found when the knee and hip are slightly bent, by taking a line from the middle of the fold of the groin down to the inside of the knee. A deep wound anywhere in this line is apt to wound the main artery. In many trades such an accident is likely to occur. A shoemaker at work involuntarily brings his knees together to catch the knife he drops; the consequence is that, with the butt-end of the handle against the inside of one thigh and the point of the blade towards the opposite, and the thighs suddenly brought together, the point is sent into the artery.

The main artery in the thigh is a large vessel which, if fairly cut across, would cause death in one or two minutes. Luckily the vessel is not usually completely cut across, but only wounded, when many minutes may pass before bleeding to death ensues. The first officer killed in the last Egyptian war was shot about two inches below the fold of the groin, and the artery completely cut across. The soldiers with him knew not what to do, and in two minutes his young life spent itself on the arid sand. It is as cruel to allow soldiers to go into battle ignorant of the means of stopping hæmorrhage as it is to allow the seafaring population to be ignorant of swimming.

Place a walking stick along the inside of the thigh with its upper end in front of the groin and its lower end behind the knee,—you have at once the course of the artery, and you will see how straight is the course of the

artery. Hence the artery comes to be in front at the hip, to the inner side at the centre of the thigh, and behind at the knee; it in this way avoids the pressure to which it would be subjected were it anywhere else. Were the artery placed behind the hip, every time one sat down the vessel would be stopped; hence it comes in front. Whilst passing from front to back of the thigh, it might have gone down either the inner or outer side; on the inner side it gets protection, on the outer side it would be exposed; hence nature in her wisdom brings it along the inner side to be out of danger's way. Were the artery anywhere else than behind the knee, it would be compressed when one knelt down were it in front, compressed when one brought the knees together were it on the inner side, and exposed to danger were it on the outer side; hence the artery is behind. With these general observations, namely, that vessels pass along the protected part of a limb and on the flexure side of a joint, we can now rapidly finish an account of the vessels in the lower extremity. **The Artery behind the Knee**, the continuation of the femoral, is called the artery of the ham, or the *popliteal;* it is about equal in size to a cedar pencil. It is deeply placed, and can with much pushing and difficulty be felt pulsating. The popliteal artery, or artery of the ham, divides into the **Two Arteries of the Leg.** The large bone of the leg, the tibia, affords protection to the arteries, and baptizes them both *tibial;* one is called the *anterior*, meaning in front of, the other is called the *posterior*, meaning at the back of, the tibia. They are, however, really deeply sunk between the two bones of the leg. Were they otherwise they would be in danger, as no part of the leg is protected either front, back, or sides; hence is it that the arteries are sunk deeply between the bones for protection's sake. So deeply placed are they, that although they do not escape being wounded, still it is impossible to stop the bleeding from them by pressure *on* them either by the fingers or by any appliances. The two vessels pass across the ankle and enter the Foot: the one on the front of the

leg passing naturally across the front of the ankle and on to the top, back, or dorsum of the foot; the other from the back of the leg, passing along the inner side of the ankle to enter the inside of the sole of the foot below the instep, where the arch of the foot is. It thus avoids the pressure to which it would be subjected in any other part. As soon as the artery enters the under surface, sole, or plantar region, it divides into two vessels, *the internal and external plantar;* these vessels, a little larger than crowquills, supply branches to the tissues of the foot and the toes.

When an Artery is Cut it is very plain what will take place: (1) The blood will spurt out in jets, the jets corresponding to the pulse, *i.e.* the beats of the heart; (2) the blood will be scarlet in colour; (3) it will flow in a direction away from the body.

BLEEDING FROM ARTERIES.—Now, then, what is to be done when bleeding from an artery occurs anywhere in the thigh? for when you master the principle of stopping bleeding in one region you know it for all others.

The object is to stop the flow. Can this always be done? In the limbs, yes. How? By applying pressure, in some cases on the bleeding point itself, in others between the wound and the heart. Thus in a wound of the artery in the centre of the thigh, the bleeding can be stopped by pressure applied above that point, *i.e.* between the wound and the groin. This is easily enough understood when it is borne in mind that the blood is flowing downwards from the heart towards the thigh. Now, just as you stop a garden watering-pipe that has burst from deluging the lawn by putting your foot on the india-rubber anywhere between the water-tap and the burst point, so may you stop bleeding from an artery; and just as it is well-nigh impossible to stop such a pipe if it goes across a bed of straw by putting your foot on it, so is it well-nigh impossible to compress an artery against soft tissues like muscles. It is important then, to press against something hard, and this is, in the case of a water-pipe, the ground, and in the case of an artery, a bone.

To stop bleeding at any given spot in the lower limb, it is necessary to apply pressure upon the vessel above the wound, *i.e.* between it and the heart. Pressure may be applied by—

1. The fingers. This is technically called *digital compression*, *i.e.* pressure by the digits, or fingers. This is the most useful to know, as you have your fingers always with you, and you can call them into immediate use ; bandages, and even pocket-handkerchiefs to be used as bandages, may not be at hand when the critical moment arrives, and pads, such as stones, corks, &c., are always out of the way just when you want them. So trust to your fingers, and most of all trust to your thumbs. Use your fingers, especially your forefinger, to feel with, use your thumb to press with ; from its very appearance its broad flat end is evidently meant for pressure, whereas your forefinger, educated to touch, and so sensitive, is evidently intended, and has been trained by generations before us, to become the perceptive organ it is.

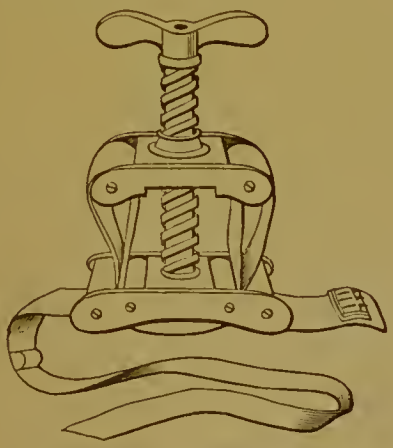

FIG. 5.—Petit's Tourniquet. See pages 30 and 36 for application.

2. Instrumental compression by what are called *tourniquets*. These instruments are specially made, are to be had of any surgical instrument maker, and are of many varieties.

The one figured here is only a type. It is called Petit's,

and has a claim to precedence on account of its excellence and its age. Others are called—Signorini's; the field tourniquet; the winged tourniquet; Esmarch's tourniquet; and the most recent one is an excellent invention, simple and complete, by Mr. Andrew Maclure (Fig. 6).

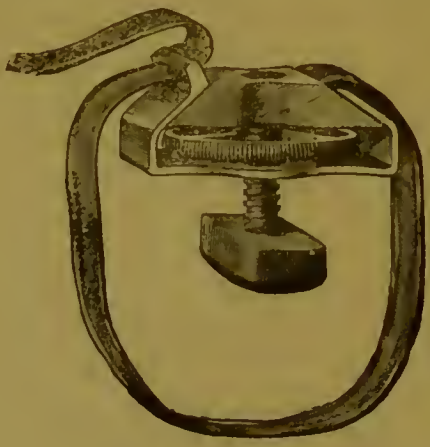

FIG. 6.—Maclure's Tourniquet.

They all act on the principle of a strap round the limb, with a pad on the vessel, and a screw or wheel apparatus by which to tighten the strap and press the pad further and deeper on to the artery. These instruments are excellent, and fulfil their purposes in surgical operations and in hospitals, but the further discussion of them is useless, as they are not in the hands of the community. It is the principle only which is useful, namely, that a *strap* round the limb, a *pad* on the vessel, and the *means of tightening* the strap, are all that is wanted.

3. Tourniquets may be *improvised* on the principle of the instruments just mentioned, but instead of being provided with ready-made pads, straps and screws, the *pad* may be a stone, marble, cork, snuffbox, piece of coal, piece of wood, pocket matchbox, a small watch, a reel of cotton, a ball of wool, a bunch of keys wrapped up well in a handkerchief, &c., &c. Anything which is hard and handy is all that is wanted. The *strap* around the limb may be a handkerchief—two, if one is not long enough—a leather strap, an

elastic trouser-belt, such as is worn at football, cricket, &c., a trouser-brace, a long cotton stocking, a garter, &c.—anything which is long enough and strong enough to surround the limb, and capable of standing traction without tearing. The *screw*, or wheel, is represented by a stick used to twist the bandage or strap so as to make it tight. To accomplish this, a walking-stick may be used, an umbrella, a key, a pencil, a penholder, a knife (shut), a bayonet, a sword-sheath, a ramrod or cleaner, a policeman's truncheon, &c.—

FIG. 7.—Improvised tourniquet to stop bleeding in thigh.

anything of the kind, which is strong enough whereby to employ force, and which is most handy.

These are the means at our command; and now to apply them.

1. Supposing *a wound in the upper third of the thigh*, say three inches below the groin. What is to be done? Pressure must be applied above the wound by the thumbs (digital compression, that is) at the point indicated in Fig. 8. It is well-nigh impossible to fix a tourniquet here; besides, you must compress with the fingers first on all occasions, so apply your thumbs at the point indicated, namely, the

centre of the fold of the groin, and press straight back

FIG. 8.—Compression of the artery at the groin for bleeding below that point.
N.B.—The thumbs are a little too low down the thigh.

Both thumbs are to be used, the one over the other, as indicated in the figure.

How hard are you to press? Until the blood stops

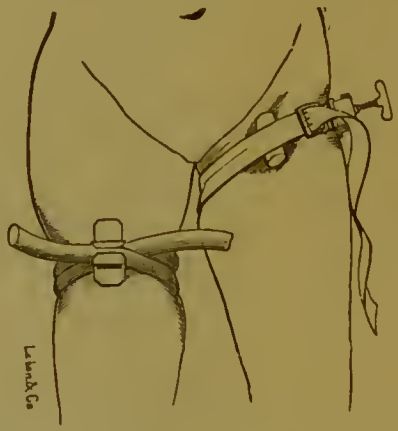

FIG. 9.—On the right thigh is an Esmarch's tourniquet, consisting of an elastic band with a catch to hold it. On the left thigh a Petit's tourniquet is applied.

flowing from the wound below. There is no fear of your not pressing hard enough; you will be so wildly excited

by the gush of blood, and the endeavour to stop it, that you will likely push with all your might. Now the joints of your thumbs are not able to bear the full weight and pressure of your body for more than a minute, and your thumbs will get tired long before assistance can come. You should, then, harbour your strength; and if at first, in the moment of excitement, you press as hard as you can, you will remember, perhaps, by and by that this amount of pressure is unnecessary, and that only sufficient is wanted just to stop the flow of blood.

Is this certain to stop the bleeding? Absolutely, if you have your thumbs upon the artery. How can you tell when you get your fingers on an artery? Because you can feel it beat or pulsate.

Supposing your thumbs get tired, you would ask a bystander, acting under your directions, to slip his thumbs on over yours, and you would then slip yours from beneath his.

Supposing assistance, that is a doctor, is a long way off—say five, ten, forty, fifty miles, as may occur in the colonies—you cannot go on grasping with the thumbs, but you must do the following: Put a pad, *i.e.* a stone, cork, &c., wrapped up in a handkerchief on the vessel immediately above or below the spot at which you are compressing; tie an elastic band, if you can get it, if not, a trouser-brace, or leather strap, &c., &c., round the top of the thigh and along the fold in the groin; and, crossing the ends on the side of the hip, bring the ends round the body, and tie tightly. This will stop bleeding until the doctor comes, when your responsibility is given up.

II. *A wound involving the main artery, the femoral, at or below the middle of the thigh, or the artery at the back of the knee-joint—the artery of the ham*—the popliteal. Proceed as follows:—

1. Compress the vessel at the groin with the thumbs in the way directed (page 10) and get a bystander to make a pad and get a bandage (see page 29).

2. Then apply a pad, *e.g.* a stone, &c., wrapped in a handkerchief (see page 29, Fig. 7), somewhere in the line

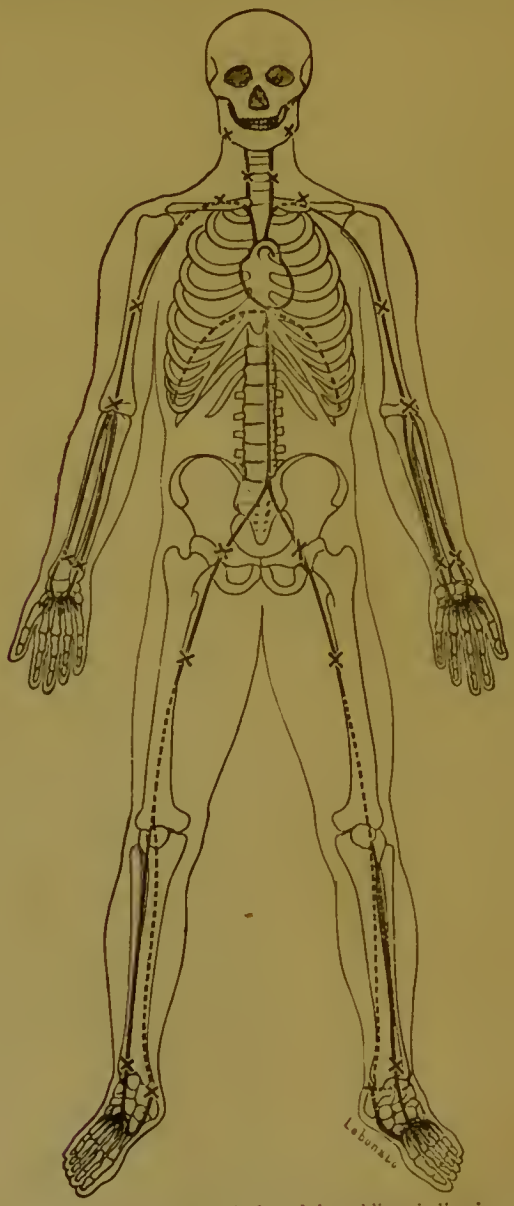

FIG. 10—Showing: 1. The skeleton. 2. Black and dotted lines indicating course of arteries. 3. X X, showing where compression may be applied.

of the artery on the inside of the thigh, and above the wound. Round the limb and over the pad pass a hand-

kerchief, tie the ends with one catch of the knot, *i.e.* with a half knot only, then apply a stick or umbrella on the half knot, and, including the stick, make a complete knot ; the stick which is to be used as a tourniquet is tied between or in the knot. Now twist the stick until the bandage gets tight, and the bleeding is controlled. Whoever has the thumbs on the artery may not remove them until the stick is being twisted. When the bleeding has stopped, fix the stick, umbrella, or what-not, by tying it to the limb above and below the seat of the tourniquet. It will thus act as a splint and keep the leg still. In this state the patient can be moved on a stretcher or in a vehicle to the doctor. If on the way there the bleeding recurs, undo the ends of the stick, and give it another twist, replacing it again by the side of the limb.

You will be anxious to know how long this tourniquet can be left on. Until the doctor comes. But supposing he does not come for six hours—you can do this : after an hour or two, you might carefully undo the stick above and below, and slowly and gradually untwist, keeping your eye fixed on the wound. On the blood appearing twist the tourniquet tightly again and fix it. At the end of another hour or two, you may untwist slowly again. Supposing this time no bleeding occurs, you ought, having slackened the tourniquet, to leave it applied loosely, so that on the reappearance of bleeding it may be twisted up immediately. Never remove the tourniquet altogether before the doctor has seen the patient.

III. *Wounds of the arteries in the legs* are not very common, but when they do occur—

1. Compress the artery of the thigh by digital compression. (See Fig. 8, p. 30.)

2. Apply a pad and tourniquet over the artery in the thigh (Fig. 7, p. 29), and apply a piece of lint or handkerchief soaked in cold water on the wound, and tie it tightly with a handkerchief or triangular bandage.

3. Another method is to put a pad behind the knee, and,

flexing the leg forcibly, tie the leg to the thigh, as indicated in the diagram.

FIG. 11.—Stopping bleeding from the leg by a pad placed behind the knee joint.

IV. *The arteries of the foot* may get wounded either above or below ; above by something falling on the foot, below by treading on a piece of glass, &c. What is to be done?

1. Get the boot and stocking off quickly—cutting both.

2. Place the thumb on the bleeding point. The tissues here are so dense and thin that direct pressure will be of avail.

3. Now do one or other of the following :—

(*a.*) Apply a pad (a conical-shaped one is best) on the wound, and tie it on tightly with a handkerchief or triangular bandage put on like a figure of 8 round the ankle. If this be insufficient,

(*b.*) Place a pad, a couple of corks, one on the front, the other on the inside, of the ankle-joint, and tie tightly round with a handkerchief. (See the X X marked on Fig. 10, p. 32.) If this be insufficient,

(*c.*) Put a pad behind the knee, and double the leg on the thigh. (See Fig. 11) ; or,

(*d.*) Put a pad and tourniquet on the artery in the middle of the thigh. (See Fig. 7, p. 29).

So much, then, for the main arteries of the lower extremity.

It is now necessary to revert, and to follow the vessels spoken of as coming off from the arch of the aorta,—they are two arteries to the head and neck, the *carotids;* and two arteries to the upper extremity, the subclavians,—and to see what can be done to stop bleeding in the regions to which they go.

In the first place, then—

The Arteries of the Upper Extremities.—Coming off as the diagram indicates, p. 23, each of the arteries to the upper extremities, THE RIGHT AND LEFT SUBCLAVIAN, passes up to the root of the neck, lying immediately behind the collarbone. To feel either vessel, and to ascertain its position, you may either bare your own neck, and standing in front of a looking-glass take a deep breath, when a hollow, "the bird's nest," is seen to become apparent just above the clavicles, or you may get a friend to bare the neck

FIG. 12.—Compression of the artery behind the collar-bone to stop bleeding from the armpit.

when the same thing may be seen. Into this hollow push the thumb or forefinger downwards against the first rib, when the artery can be felt to pulsate. We shall see by and by that this is the means of compressing it. The subclavian artery passes from behind the collarbone down to the armpit. The technical name for the armpit is the *axilla*, hence the artery, vein, &c., are called

THE AXILLARY—When on a cold day you put your

fingers into your armpits to warm them, and press your arms to your side, you can feel an artery beating against the back of your fingers—that is the axillary artery.

The axillary artery leaves the armpit and enters the inside of the arm, where it is called **the artery of the arm**, or

THE BRACHIAL.—The guide to this vessel is the inside seam of the coat or jacket. Catch hold of your own left coat-sleeve at the wrist with your left hand, and get your left forefinger upon the seam. Now look up the seam, and you will see that it comes from the armpit along the inside of the arm, and finally into the front of the elbow-joint. That is exactly the course of the artery, and your finger placed upon it anywhere will feel the artery beat. Supposing the coat is off, the general idea of the course of the artery is gathered from what has been said, but its actual course is found on the hollow along the inside of the biceps muscle, which forms the swelling and prominence in front of the arm. This vessel may be compressed by the fingers—digital compression—in the middle of the arm, thus:

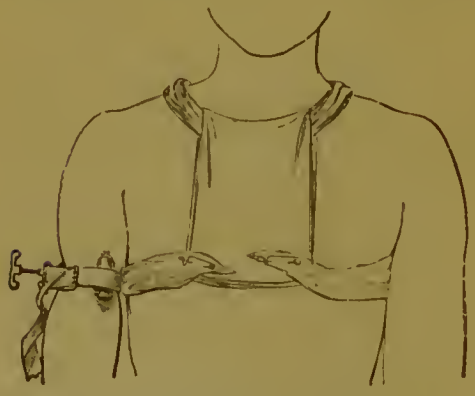

FIG. 13.—On the right arm is a Petit's tourniquet applied. On the chest are bandages applied to keep on a dressing or poultice.

FIG. 14.—Compression of the artery in the arm by the fingers.

To compress the artery in the left arm. Stand behind the left arm, and pass the fingers of your right hand in front of the arm until the finger-points are well to the inside of the biceps muscle; then grasp the limb firmly. The artery will be felt beating, and if the forefinger of the left hand

be applied to the pulse at the wrist (see below) it will be felt that the pulsation ceases, or goes on, according as you tighten or relax the right hand, which grasps the arm and commands the artery. The artery in the right side may be controlled in a like manner. Instead of passing the fingers in front, they may be passed behind the limb, and the artery grasped from the back of the arm, as it were. This is the best plan in a very muscular arm.

The artery now passes from the front of the elbow to the forearm, where it immediately divides into two vessels of nearly the same size. The vessels in the forearm, as in other parts, pass along the protected side of the limb so that both come to be in front. When any danger approaches, one naturally throws up the forearm to ward off the blow; were the blood-vessels on the back of the forearm the blow would endanger them, hence nature has placed them in front, where we have two vessels corresponding to the two bones. The bones are nearly of a size, hence they claim and baptize an artery each,—one the ULNAR artery, in front of the ulna, the other the RADIAL, in front of the radius. The vessels are about the size of goose-quills.

The outer artery, the radial, is the one in which the pulse is felt. THE PULSE is the beat of the artery felt at the pulse hollow of the wrist, which is placed one inch above the wrist and half an inch from its outside, that is the thumb side of the forearm.

The arteries at the wrist behave differently in regard to the way they enter the hand. The one on the inner side, *i.e.* the little-finger-side—the ulnar—passes on to the front of the wrist, and runs along the "line of life" at the ball of the thumb. The other, on the outside or thumb-side—the radial—passes on to the outside, then on to the back of the wrist, and disappears deeply between the thumb and forefinger to reach the palm of the hand.

It is considered very dangerous to cut one's self between the thumb and forefinger; so it is, if the cut is deep enough, because the artery might be cut as it passes from the back of the hand to the palm of the hand.

In the palm of the hand the two arteries form *arches:* one immediately below the skin, the other deeply on the bones, and both arteries help to form each arch. From the arches branches are continued forwards to the fingers, where they pass along the sides, and are thus out of the way of danger and compression as much as possible.

The lowest available spots at which to apply pressure are on the arteries immediately above the wrist. It can be applied by the thumbs placed as in the diagram, when hæmorrhage from the hand can be controlled by pressure at the points indicated.

FIG. 15.—Compression of the arteries at the wrist—the radial and ulnar—by the thumb, to stop bleeding from the hand.

We are now in a position to know *what to do should severe arterial bleeding take place anywhere in the upper limb.*

I. Supposing severe bleeding were to take place from a *wound in the hand,* say from one of the palmar arches :—

(*a.*) Apply the thumb on the bleeding point at once ; if the doctor lives near, keep the thumb there till he comes ; if he lives at a distance,

(*b.*) Apply a stout pad so as to fill the palm of the hand, and, doubling the fingers over the pad, tie the whole tightly with a handkerchief or triangular bandage. Apply a sling, and take the patient to the doctor. Supposing this is not sufficient,

(*c.*) Take a cork, cut it lengthwise, and apply one half

on the thumb-side of the wrist, the other on the little-finger-side, at the spots indicated on Fig. 15. Lay the corks lengthwise to the wrist, and place them with their rounded surfaces on the skin. Fix the pads in position with a bandage. Apply a sling.

(*d.*) Another method is to put a pad on the front of the elbow, and double up the forearm on the arm, and tie the two together: then tie the limb to the side. (See Fig. 16.)

FIG. 16.—Compression of the artery at the bend of the elbow to stop bleeding from the forearm or hand.

(*e.*) Instead of using pads the arteries at the wrist may be compressed by the thumbs, as at Fig. 15; or the artery of the arm may be compressed by the finger, as at Fig. 14, p. 36.

(*f.*) An improvised tourniquet may be applied to the artery in the arm. (See page 36.)

II. *Arterial bleeding in the forearm* may be stopped by—

(*a.*) Doubling up the forearm on a pad (Fig. 16); or

(*b.*) Compressing the artery in the middle of the arm by a field- or improvised tourniquet, or by the fingers.

III. *Arterial bleeding at the elbow or lower end of arm* may be stopped by—

(*a.*) Compressing the artery in the middle of the arm by a field- or improvised tourniquet, or by the fingers.

IV. *Arterial bleeding from the armpit* may be stopped by compressing the artery behind the collarbone (see page 35), by applying the thumb in the "bird's nest" just

above the collarbone, and pressing down with all your might (Fig. 12, p. 35). The pressure is directed against the first rib. Instead of the thumb, a key wrapped in a fold of the handkerchief may be applied.

The only arteries that remain to be followed are the **carotids**. These arise as seen in diagram (page 23), from which point they ascend, as the *common* carotid arteries, on either side of the windpipe towards the skull. Their pulsation or beat can easily be felt on one's self. Each artery divides into two—one, the *external* carotid, to supply the outer parts of the head, the larynx, tongue, face, nose, scalp and back of head; the other, the *internal* carotid, to supply the parts inside the cranium, and chiefly the brain.

When wounds of the carotid arteries occur, as in cut throat, pressure is to be applied by the thumb below the wound by the side of the windpipe on which the wound is. No tourniquet can be applied here; the thumb alone must be trusted to. (See Fig. 17.)

FIG. 17.—Compression of common carotid artery to stop bleeding from wounds of the arteries higher up.

Almost any one of the branches of the external carotid may be wounded :—

1. *Bleeding from the tongue* may generally be stopped by giving ice to suck, if it can be got; if it cannot, washing

the mouth with cold water, loosening tight clothing about the neck, opening the windows and doors so as to get cold air to breathe, and causing the patient to breathe through the mouth.

If the wound is far back, it may be necessary to compress the artery in the middle of the neck on one or both sides until the doctor comes.

2. *Bleeding from the lips* may be very severe; it may be stopped by compressing the lip between the forefinger inside the lip and the thumb outside, on one or both sides of the wound.

3. *Bleeding from the nose* may come from a fall or blow, or it may be the result of constitutional disturbance, and the sign of disease. From whatever cause, it must, when excessive, be stopped. A doctor should be sent for if the bleeding is very severe; but whilst he is being fetched, attempt some of the following restoratives:—Open the windows, and undo tight clothing about the neck. Do not let the patient hang the head over a basin, but lay the patient on a chair or couch in the position of repose; raise the arms, stretched to their full extent, above and rather behind the head. Apply a cold wet sponge or towel to the back of the neck, turning down the collar of the coat, vest, and shirt to reach the proper spot, which is just at the top of the back, between the shoulders; a large key, or a bunch of keys, are the usual remedies, and they are as effectual as anything else, provided they are kept cold. Over the forehead, just at the root of the nose, a cold sponge, or a piece of ice in flannel, or an ice bag, may be applied. If the bleeding still continue, syringe the nose with cold water; or a strong solution of alum and water, or strong cold tea may stop it. If all these efforts are of no avail, pinch the nose just where the bones and the gristle (cartilage) join (that is, about half-way up the nose) between the finger and thumb. If this does not stop the bleeding, and the doctor has not come, take a piece of handkerchief or soft rag of sufficient size, and, wrapping it up tightly, push it into the bleeding nostril.

It may be impossible by all these means to stop the bleeding, and it will require medical skill to plug the nostrils front and back.

4. *Bleeding from the face*, below the eyes, may be stopped by grasping the whole cheek as far out as the wound, with the finger inside the cheek and the thumb outside ; or by applying pressure on the edge of the jaw at the back part with the finger laid lengthwise, because there the artery to the face comes over the jaw from the neck (Figs. 1 and 10). Instead of the finger, a long stout pad may be so tied on as to stop the bleeding. The bandage or scarf used must pass below the chin, then upwards to the top of the head, where the ends are crossed, not tied, but brought down below the chin and tied there, pulling tightly—in fact, tight enough to stop the bleeding.

Fig. 18.—Stoppage of bleeding from the temple by a pad and twisted bandage.

5. *Arterial bleeding from the front of the head, temple, top or back of the head*, may be stopped, when from a small wound, in this way :—apply a pad, of about one inch in thickness, and in the form of a cone. Make the pad of pledgets of lint, folded tightly and laid one on the top of the other, a penny-piece being folded up in the last pledget. The point of the cone is to be applied on the wound, and a bandage carried round tightly. The way to apply this bandage is represented in Fig. 18, where it is applied to keep a pad on a bleeding artery in the *temple*. First, the pad is placed on the wound ; then

a scarf or triangular bandage, folded narrowly, is placed with its centre on the opposite side of the head ; the ends are next brought round and twisted once, twice or thrice firmly and decidedly immediately over the pad ; the ends are then either carried round the head (or one end passed over the top of the head, the other one beneath the chin), and tied on the opposite side, or where they happen to meet.

The same method may be followed with bleeding at the *top of the head*, viz. a pad over the wounded vessel, a scarf or folded triangular bandage with its centre applied below the chin, the ends twisted on the top of the head over the pad, and brought down again and tied below the chin. The same principle may be followed with bleeding from the *forehead.* Apply a conical pad over the wound ; fix it with a scarf or folded triangular bandage, applying the centre of the bandage at the back of the head, bringing the ends forward and twisting them over the pad, and tying them at the back of the head. The same method may be adopted, but with exactly reverse steps, for the *back of the head.*

Bleeding from Veins.—The veins which are most likely to give rise to dangerous bleeding are the veins of the legs, and these chiefly when they become varicose or dilated. Still it does occur that venous blood is lost in quantity in other parts of the body where veins come near the surface, as in the neck or at the bend of the elbow. Blood coming from a vein can be easily recognised—

1. By the dark colour ; it is purple, or bluish-purple, or bluish-black in appearance.

2. The blood comes in a sluggish stream when a large vein is wounded, or simply wells up as a dark oozing flow when a smaller vein is wounded.

3. The blood comes from that end of the cut vein which is away from or most distant from the heart. In varicose veins, however, it comes in huge quantity from the end nearest the heart, as well as in smaller quantity from the end farthest away.

To stop bleeding from a vein —

1. Apply the thumb immediately on the bleeding point; moderate pressure will be sufficient to stop the flow of blood from even a large vein.

2. If it is in the limbs, a pad made of some hard substance is to be applied *on* the wound, and tightly fastened with a bandage, handkerchief, or scarf. If the wound is a large one pressure might have to be applied immediately *below* the wound in the course of the vein. If it is a varicose vein, pressure *on* the wound may suffice, but if it is a large wound opening up a varicose vein, pressure *above and below* the wound would be necessary. In all cases elevate the limb.

A vein bleeding in the neck must be stopped, as in the case of an artery in the neck, only by the thumb, until a doctor sees it.

Capillary Hæmorrhage is the hæmorrhage which occurs when the skin is cut. The capillaries are everywhere, are in large numbers, are microscopic, and when even a moderate or small sized cut is made they bleed by hundreds. The bleeding from a capillary is recognised from the facts that—

1. The blood is red in colour. Arterial blood we saw to be scarlet, venous blood to be dark purple, but capillary is red.

2. The blood comes from all parts of the cut surface; this is evidently what must occur, as the capillaries are everywhere.

3. The blood comes in a brisk, smart, free stream, different from the sluggish flow of venous blood on the one hand, and the jets of an artery on the other.

To stop capillary hæmorrhage many manipulations and remedies are employed :—

1. Compress the bleeding point with the thumb; you may keep it compressed, if your own finger is cut, for five or ten minutes. This may stop it altogether.

2. Instead of the finger, a pad of lint rolled up firmly may be applied and bandaged tightly to the wound.

3. Styptics (these are means of causing the blood to clot or coagulate) may be applied; they are :—

(*a.*) Cold, in the form of cold air, cold water, or ice. Waving the cut finger above the head may help to cause the blood to clot; cold water, although it seems at first to favour the flow of blood, aids in stopping it; a piece of ice is invaluable, especially in internal hæmorrhages.

(*b.*) A piece of wool, a cobweb, a piece of tobacco-leaf, cold tea, &c., are all of them household remedies, and at the same time their action is capable of scientific explanation. The first two mentioned present a mesh-work in which the blood is caught, and has an opportunity of coagulating; the last two contain specific substances which tend to cause blood to coagulate: tobacco-leaf contains nicotine and other substances which cause a painful nipping sensation in the wound; whilst tea contains tannin, especially when drawn for a long time, and is a strong styptic.

(*c.*) Iron drops. The perchloride of iron applied on a minute pledget of lint and pressed into the wound is a pretty sure and safe styptic.

(*d.*) If the wound is small, but pretty deep, and capillary hæmorrhage active, as after a leech-bite, and the doctor is a long way off, or you are on board ship, summon up courage to pass an ordinary sewing needle through the skin, transfixing the wound; over this apply a thread (reel cotton will do) figure-of-8 method, which, when pulled tightly, will stop the bleeding.

WOUNDS.

I. *Incised* wounds are such as are produced by a cut with a knife. Treatment: Wash the part, and stop the bleeding. If the wound gapes, pull the edges together with ordinary diachylon plaster. To heal it, and keep it clean, apply cold water dressings or Friar's Balsam.

II. *Contused* wounds are bruises or contusions of a part with a tear of the skin, as are inflicted by a blow with a club. Treatment: Do not bring the edges together by strapping plaster, but apply a spirit lotion made of one-

third spirits of wine and two-thirds water, or whisky one-third and two-thirds water, and cover over lightly. For *severe bruises*, use either flannels wrung out of hot water, or apply cold lotions,—either simple water, or whisky and water, or arnica lotion. Use whichever is most agreeable to the patient. If the bruise is near a joint put on a splint.

III. *Lacerated* wounds are those produced by a piece being torn off, such as happens in accidents from machinery. Treatment: There is usually no bleeding to stop. Wrap the part up in flannels wrung out of hot water, and treat the patient for shock (see page 236).

The Triangular Bandage.

In our fathers' days pocket-handkerchiefs were of such ample size that triangular bandages were always at hand. Since, however, handkerchiefs have become reduced in size and of finer texture, they are useless as slings or bandages. To replace them for these purposes the triangular bandage has been devised. It is nothing new; our fathers carried them in their pockets, and our mothers on their shoulders in the form of a small shawl, but we have to resort to a special device to supply its place, as fashion has condemned the use of such articles of apparel.

To make triangular bandages secure some yards of unbleached calico; take a piece of this, one yard square—that is, 36 inches every side—and cutting from one corner to the opposite corner you will get two triangles. If it is for a big man, you will require the bandage to be 38, 40, or even 42 inches square.

The named parts of the bandages are seen in Fig. 19: the *apex*, A; the *base*, B; the *ends*, E.

To fold this bandage for application, you should lay the bandage on the table or floor and stand opposite the base; then seizing the apex A with the right hand, bring it down to the centre of the base B; fold again towards yourself, doubling it—this is a *broad folded bandage;* fold again in the same way—it is now a *narrow folded bandage.*

The methods of application are sufficiently indicated by the diagrams, so that a detailed description of each is useless. As an example of one. To apply a sling (p. 48): Stand in front of the person to be bandaged. Place the apex beneath the elbow of the injured limb, and lay the upper end across the top of the opposite shoulder. Lay the forearm across the chest, bring the lower end upwards over the forearm, and tie the ends by a reef-knot on the top of the shoulder. The knot should be on the same side as the injury and pretty well down towards the front of the shoulder, so that it will not cause inconvenience. The apex projecting behind the elbow is now to be pinned over the arm.

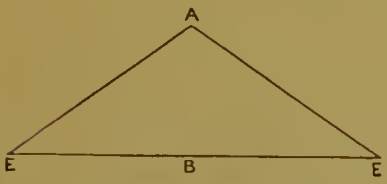

FIG. 19.—Triangular bandage. A, apex; B, base; E E, ends.

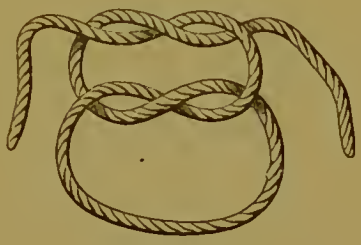

FIG. 20.—A reef knot.

FIG. 21.—Appearance of bandage tied with reef-knot

The only points to be sure of are, that the hand does not drop below the level of the forearm, and that the knot is properly placed so as not to hurt. The knot should be a sailor's or reef-knot, not a granny (see Figs. 20 and 21). This is to prevent slipping.

FRACTURES.

Broken bones are occurrences of an every-day experience in the streets, mines, on board ship, and even in house and home. The regulation of traffic in our crowded thoroughfares has done much to stop such accidents in our

FIG. 22.—Larger arm sling.

FIG. 23.—Four-tailed bandage for back of head. Triangular bandage applied to chest.

FIG. 25.—Four-tailed bandage applied for broken lower jaw. Bandages applied to keep a dressing on the shoulder, with smaller arm sling. Bandage for hand. Bandage for hip.

FIG. 24.—Triangular bandage applied to scalp.

FIG. 26.—Bandage for foot. (The knot should have been below.)

streets; and since policemen have been stationed at the *corners* of streets and crowded places, any hospital surgeon will tell you of the diminution in the number of street accidents concurrent with that change. On board ship their frequency is diminished from the lessened necessity of going aloft in modern times. Still the number of preventable fractures is immense, and we must discuss them pretty fully if we are to understand what to do.

Bones are broken in many ways, but amongst the legion of causes, it is possible to classify them under two heads: *Direct* fractures, as when a cart-wheel goes across the leg and breaks it at the part where it crossed. *Indirect* fractures, as, when lighting on the hands in trying to save one's self when falling from a height, the collarbone is broken.

A variety to be mentioned, also, is when bones break by the force of the action of muscles, as when the knee-cap is broken in attempting to jump, or on missing a step on the stair. Now when a fracture has occurred, no power on earth can by immediate treatment join the bones together at once; but by immediate action and treatment on the part of the bystanders or friends, a fracture which is simple at first may become in unskilled hands a much more dangerous accident, whereas in skilled hands it may be prevented from becoming worse. That is all that it is necessary for you to know, viz. *how to prevent a broken bone giving rise to more serious trouble*, it may be loss of limb or loss of life.

Of course a doctor cannot be at the patient's side immediately—that is, in half a minute—however close he live, and it may be hours before a medical man can reach the patient. It matters not whether it be five minutes or hours; it is your duty to know what to do for these five minutes, because all the damage may be done, and generally is done, within that time.

To understand the preventable occurrences that may follow on a broken bone, it is necessary to know the different kinds of fractures:—

1. A *simple* fracture is one in which a bone is simply

broken into two pieces; no joint is injured, no vessel torn, nothing is injured except the bone and its immediate surroundings.

2. A *comminuted* fracture is one in which the bone is broken into several pieces—smashed, in fact. The injury is also in this case confined to the bone.

3. A *complicated* fracture is a broken bone complicated by an injury to the surrounding structures; in the case of the limb-bones it may be an artery, vein, or nerve that is torn, or a joint that is opened; in the case of the ribs the lungs may be torn; in the case of the pelvis, it may be the bladder; in the case of the cranium, it will be the brain.

4. A *compound* fracture is one in which there is a broken bone compounded with an injury to the skin. This differs from all the previous kinds, as in it the skin is torn and the air communicates with the ends of the bone.

It is the last two fractures which are preventable, as the general cause of their occurrence is from careless movement on the part of kind but ignorant bystanders or friends. The willing friend may by his proffered help and kindness be the means of sacrificing limb or life through ignorance. A simple fracture may be so unskillfully handled that it may become complicated or compound, involving weeks longer of confinement to bed, not to speak of the dangers to limb or life that ensue from tearing the main artery or vein of a limb, or sending the end of the bone through the skin.

How can you tell when a bone is broken? To illustrate this we shall imagine the thigh-bone broken about its middle. As there is only one bone in the thigh, so consequently we shall see the full effect of a broken limb-bone.

You can tell the thigh-bone is broken from the following signs and symptoms :—

1. The patient will have fallen down and be unable to rise.

2. The broken limb or limbs will be motionless.

3. You may see the mark on the skin or clothing where the cab-wheel ran over the patient.

4. You will observe that the foot is in some unnatural

position, being flat upon its outside, or in some position it could not be in unless the bone were broken.

5. The limb of the broken side will be shorter than its fellow, as seen by looking at the feet.

6. Could you see or feel the seat of the fracture you could both see and feel that there is a swelling at the seat of the fracture, caused by the broken ends of the bone overriding each other.

7. The patient can refer you to the broken spot by the pain felt there.

8. When you get your hand on the part, and should the patient move the limb, you may feel grating or *crepitus* of a nature peculiar to fracture. It is caused by the rough ends of the bones moving against each other.

9. The patient may tell you of a snap or crack felt at the time of the accident.

In the case of a broken thigh-bone all of these signs and symptoms may be made out, but in the case of other bones only a few may be present. Thus in the case of a leg-bone, there would not be so much shortening, and the foot might be only slightly misplaced ; the cause might be an indirect fracture, as on alighting on the feet, when there would be no marks on the skin or clothing, and so on. Still, it is but seldom that the signs of fracture are not apparent.

There is a variety of fracture I must tell you of, just to teach you the true nature of a bone. It is what is called *green-stick* fracture. It occurs in children ; their bones are soft like gristle, and they bend considerably before they break, and they differ as much from the bones of old people as does a dried stick or withered twig of a tree from a green branch. A dried branch snaps straight across, but a green twig bends and gives or cracks along one face, and may require to be cut through before the ends can be severed. So it happens with children. A nurse carrying a child in her arms, and looking one way whilst the child looks another, the child overbalances, falls back, and the nurse to save it grasps its lower limbs

to her side. The weight of the child's body snaps the thigh-bone or bones, it may be across her fore-arm. It is generally a green-stick fracture that occurs on these occasions, and it shows you how elastic a thing a bone is, and how it will bend before it breaks.

Another variety is what is called an *impacted* fracture. It will be described when speaking of the forearm.

The next thing to know is—

What to do when a broken bone occurs.—Well, first and foremost, and I should like it printed in large letters and sent about the country, *attend to the patient at the spot where the accident occurs.* The patient must not be moved from the centre of the street to the pavement, but attended in the middle of the street; it matters not if it is at the crossing of the most crowded thoroughfare, it is there where you must render aid. You need not move the patient out of the way of cabs and vehicles. No one was ever run over twice, and if *you* kneel down to attend to the injury you are in no danger of being run over. Is it never right to move the patient? Would it not be right to move the patient from the foot of the stair where he has fallen to a comfortable couch before attending to the injury? No. Would it not be right to move the patient from where he lies in the middle of a football field with a broken thigh? No. There is no departure from the rule when any bone in the lower extremity is broken; it must be attended to *before* the patient is moved.

Why is it dangerous to move a patient before fixing the limb? Because a simple fracture might be made into a complicated or compound. The artery of the thigh lies close against the thigh-bone; the jagged edge of the bone is quite near the tender vessel; and any further movement might easily send the broken end through the vessel. Again, the shin-bone, if broken, may be with but little motion sent through the skin immediately beneath which it lies. What is the usual course of events? A child's leg is run over by a cab; any one seeing the accident runs forward, and, lifting the child, carries it to the pavement,

and then to the hospital or to its home. In the process, the child's legs are dangling over the "good Samaritan's" forearm, and the weight of the foot has caused the ends of the bone to come through the skin. Pour oil into the wounds first, and *then* set him upon the ass, is the Scripture teaching, and you cannot do better than follow that; apply your splint first, and then put your patient on a stretcher.

Supposing, then, you find a man lying in the street with A BROKEN THIGH-BONE (and you can tell it is broken by some of the common-sense symptoms and signs I have told you) what would you do?

1. Grasp the foot firmly to prevent it moving about, or to prevent the patient moving it, which he will do if intoxicated.

2. Pull the foot down until it is the same length as the other, and hold the two feet firmly together.

3. Do not let go, to go in search of a splint or help. If there is no one by to help you, as in a country lane, grasp the feet with one hand and get out your handkerchief or scarf with the other, and tie the feet together. You may then let go, and proceed to apply a splint. This would, in the house, be a broom-handle; in the football field a goal-

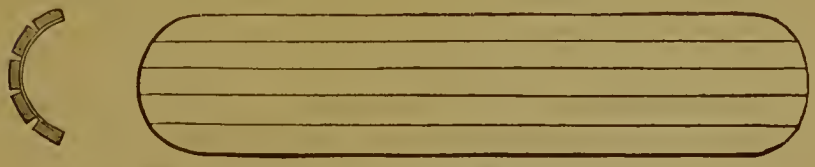

FIG. 27.—Flexible wooden splints of thin strips of lath fastened on leather. Left-hand diagram shows the same bent, and in section.

pole; at military exercises, a rifle; in a country lane, your own or the patient's umbrella or walking-stick; or any thing that is stiff and long enough. Properly speaking, for the thigh the splint ought to go all the way from the armpit to beyond the boot; hence a musket, broom-handle, goal-pole, or the like, is better than an umbrella or walking-stick, except in the case of a child, where the latter would be long enough. But it may be you have no walking-stick, not to speak of the other appliances; what is to be done

then? Tie the two limbs together tightly. Nature, you see, has provided a splint, namely, the other limb, which is always there; but it is only two or three years since it was discovered as of use as a splint, although it has been there all these thousands of years. It was a great discovery that, but I am afraid it was not the doctors who found it out. Supposing, however, the accident occurs in the street and not in the country lane, you will get plenty of people willing to assist, it may be misdirect and provoke you with their ignorant officiousness. Every one prides him- or herself on his or her knowledge of "these things," and curtails many a life by the belief. You must, if you have hold of the feet, not let go, but make other people fetch and carry; fetch a broom-handle from the nearest house, or apply umbrellas or walking-sticks if that cannot be got, and after that is fixed, and not till then, will the patient be in a fit state to be carried.

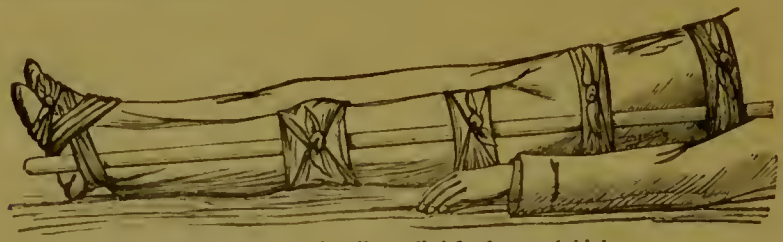

FIG. 28.—Broom-handle applied for fractured thigh.
(Another bandage round both knees should also have been figured.)

To fix a broom-handle, or the like, to a broken limb:—

(*a.*) Apply it along the outside of the limb, from the armpit to beyond the feet.

(*b.*) Tie the feet, including the splint, together as in figure 28. There is a hollow above the heels and behind the ankles where you can slip a bandage through without moving the limbs.

(*c.*) Pass a handkerchief, scarf, or triangular bandage behind the hollow of the knees, and tie the two limbs and the splint together tightly.

(*d.*) In like manner pass a bandage below (not beneath) the hips, where there is a hollow between the hip and the top of the thigh. Tie it firmly.

(*e.*) Round the body pass two bandages, one just above the hips, tying the pole to the haunch-bone, or pelvis, and finally pass a bandage round the chest just below the armpits and including the top of the splint. Do not tie your bandage round the belly, or abdomen ; a compression here, with no bone resisting, may cause inconvenience or even damage. Tie the two limbs together.

The patient is now rigid and stiff from the neck to the heels, and as the bandages are tied over the ankle, knee, and hip-joints, there is no danger of movement. In this state the patient is now safe to be carried on a stretcher to his home, or a hospital, or placed in a van, waggon, or cart in which he can lie full length.

When the bones of the legs are broken, the same signs and symptoms are present as enumerated at page 50. The danger varies directly according as both bones or only one bone is broken. When both bones are broken, the fracture is generally the result of direct violence, such as the wheel of a vehicle, or of severe indirect violence, such as alighting from a great height on the feet. In either case both bones of both legs may be broken. Fortunately only one bone is usually broken, and that bone is generally the outside small splint-bone, the fibula. Even supposing the shin-bone, or tibia, is broken alone, it is easy to see the advantage accruing from having even the small bone of the leg unbroken, as it prevents much displacement, prevents the bones twisting or falling backwards or forwards, inwards or outwards, and thereby endangering the blood-vessels. You know, or ought to know, had you read carefully at page 52, the danger of allowing the patient with a simple fracture to move ; and here the same troubles may ensue, only ten times more likely is a simple fracture to become a complicated or compound if both bones are broken in place of one. The sound bone acts as a splint to its fellow, and prevents so much mischief resulting. The most commonly broken bone in the leg is the *fibula*, and it is broken usually about four inches above its lower end. Its lower end is easily recognised just beneath the outside elastic of

the boot, and the bone can be traced upwards until it disappears in the calf of the leg.

This fracture goes by the name of Pott's fracture. The story is told of how Percival Pott, a surgeon to St. Bartholomew's Hospital, fell on London Bridge. He felt he had broken his leg, and, knowing the consequence of allowing the unskilful to touch it, he placed his back against the parapet of the bridge, and with his stick kept the Good Samaritans off, until a stretcher and skilled hands were brought from the hospital. Whilst lying up with this accident, his attention was directed to the exact nature of the fracture, and from his time the fracture has been called Pott's.

It is frequently mistaken for a sprained ankle, and very often is it the case that the doctor is not called in until after a week or fortnight, when poulticing or arnica lotion has had its try. To make out the fracture, apply the rules laid down in page 50 as guides, and especially notice that the foot is misplaced and twisted outwards. The toe is not in a line with the kneecap and shin, as it naturally is. It requires no training in anatomy to know the appearance of a sound limb, and the least suspicion of any change of shape becomes immediately apparent.

What is to be done with a broken leg-bone or bones? Follow the lines of treatment laid down on page 53 :—

1. Secure the feet ; get them in apposition ; and tie them together.

2. Apply a splint, *i.e.* an umbrella (Fig. 30), a walking-stick, a piece of matting, a folded coat, a policeman's truncheon, the sheath of a sword, a bayonet, a bundle of straw rolled up as in Fig. 29, a goal-pole or a broom-handle broken in two.

The splint for a broken leg should be long enough to go from above the knee to beyond the foot. When only one umbrella can be had, apply that along the outside and lash the other leg to the inside (as in Fig. 30), where all are tied together ; where two umbrellas can be had, put one inside, the other outside, and tie them to the injured leg, finally end off by tying the two legs together at the feet

and knee. Policemen carry with them the means of rendering aid in such cases; two truncheons are placed, one on

FIG. 29.—Improvised splint of two bundles of straw or twigs rolled in cloth, canvas, or the like.

one side of the limb, one on the other, and the band they wear on the left coat-sleeve just above the wrist, when on duty, is long enough to pass round the limb and fix the truncheons —one band fastened just below the knee, the other at the ankle; finally, the feet and knees ought to be tied together with a handkerchief or strap before moving the patient.

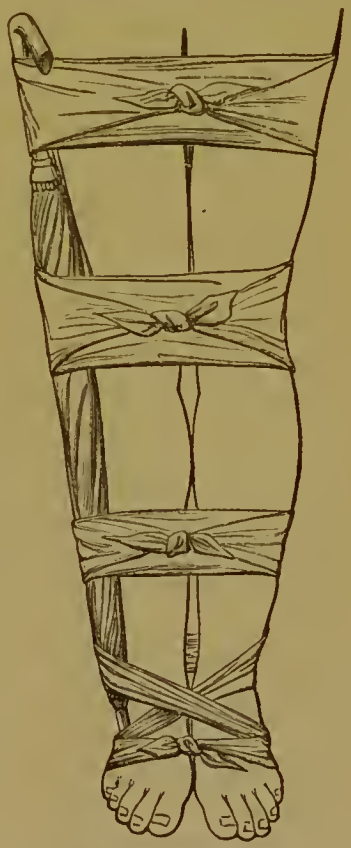

FIG. 30.—Umbrella employed as an improvised splint in broken leg.

3. Bandages must be applied, one round the feet, another above the fracture, a third above and a fourth round the knee and thigh to check movement.

A broken Kneecap (patella) is a very common accident, and until the last few years one from which there was no permanent recovery. The patella forms the front boundary of the knee, and consequently when it is broken the knee-joint is opened. As already explained (page 49), it usually takes place from muscular violence, *e.g.* in the act of jumping, when the muscles, proving too strong for the bone, snap it across its centre. The limb

becomes helpless; there will be no shortening, but the gap can be felt with the finger, and the joint will swell up almost at once. Motion must be prevented, and this is to be done by simply applying a splint, *e.g.* umbrella, along the back of the limb, or a couple of umbrellas, one outside and one inside the limb. If nothing is procurable in the way of a splint, the two limbs tied together will prevent mischief.

We must now briefly consider fractures of the bones of the trunk.

A broken Haunch-bone (pelvis) is a fairly common accident, but it is at times very difficult to make out, even for medical men; and it is beyond my power to make it plain enough to you for it to be worth our while discussing it fully. Suffice it to relate: that the patient complains of great pain in the region of the haunch-bone; that he cannot get up; that his lower limbs on examination prove all right; and that he is suffering from much shock (see page 72); then give the patient the benefit of the doubt, and treat him as though his pelvis were broken. Of course, if on applying your hand on the bone you made out grating, or crepitus, you would at once know that a fracture had taken place. Do not, however, move a broken bone about in the search for crepitus. In this particular bone the organs within the pelvis are vital, and a tear or bruise of one or other of them by the jagged edge of the broken bone might lead to fatal consequences. Give the patient the benefit of the doubt, and keep him rigid by long splints (and you know now what I mean by these) applied along both sides of the body from the armpit to the heels. These are to be tied firmly to the body and lower limbs by numerous bandages, and in this state the patient can with more safety be removed.

Broken Ribs are of frequent occurrence, and require "first aid" to be skilfully rendered, just as do other bones. Broken ribs are not of so much consequence of themselves, but it is the tender and vital organs with which they are in contact that render them dangerous to life. A rib, when broken, is in the very best condition as regards itself, for has it not a rib above and another below to act as splints

and keep it in its place? But with all that a broken rib has a drawback which no other bone has, and that is, you cannot keep it quite quiet. The patient must breathe to live, and the ribs must consequently move with the motions of the chest. Now the organs which may be injured when a rib, or rather ribs, are broken, are the lungs, the liver, the spleen, and even the stomach or heart; in fact, all those organs (see page 10) which nestle for protection under the cover of the ribs. All these organs are vital, but the lung, which is the most frequently injured, is fortunately the least so. When the lung is torn there may occur internal bleeding, with or without the coughing-up of blood. Blood brought up by the mouth may come from either the stomach or lungs; when it is *from the lungs the blood* is coughed up in mouthfuls, it is scarlet in colour, frothy from mixture with the air and fluid in the air passages; when it is *from the stomach*, the blood is vomited up in quantity, it is dark in colour, it is not frothy, but is thick and lumpy from the action of the juice of the stomach—the gastric juice.

To treat bleeding from the lung :—

1. Open the window so as to allow the patient fresh cold air to breathe.

2. Keep the patient absolutely quiet in the position of repose.

3. Give ice to suck if it can be procured, if not let the patient sip cold water, vinegar and cold water, or, better still, a strong solution of alum and water, or strong cold tea; the latter with a lump of ice in it, if it can be had, is an excellent and fairly efficacious remedy.

It may happen that bleeding may occur internally, with no evident signs except those due to loss of blood. This may arise from a broken blood-vessel in the chest or abdomen, the result of disease, a broken bone, a stab, or bullet wound. That some serious internal injury has taken place may be judged from the giddiness and pallor which speedily supervene, and the faintness which comes on when the patient attempts to stand up, or is propped up in the sitting posi-

tion. The breathing becomes short, and the heart fluttering. Nothing will save the patient if a large vessel has burst, but if it is one of secondary size (and you cannot tell which), keep the patient almost flat, absolutely quiet, and give some of the simple remedies recommended at page 75. When a rib is broken it is essential, of course, to attend to the bleeding first and foremost; you do this whether the blood is coughed up or whether you suspect from the symptoms that bleeding is going on into the cavity of the chest (see above).

To keep the rib quiet would mean binding the chest so tightly as to impede breathing, and to force the end of the rib further into the lung, and thus to cause evil instead of good. **What you do is this:** You take a broad folded bandage,—for instance, a triangular bandage folded twice,—and, applying the centre of the bandage over the spot the patient complains of (and that is the injured spot), pass the ends round to the opposite side of the body and tie them there so as to give support and comfort to the patient. Ask the patient as you gradually tighten the bandage if it is comfortable, and the sigh of relief the patient gives when the bandage is sufficiently tight indicates at once when to stop.

The same purpose is answered by swathing the chest tightly in a jack-towel, and fixing it firmly by sewing. It is safer, if you can get it, to take a piece of plaster—diachylon plaster—and strap it round one side of the chest. The piece of plaster should be taken as long as from the spine to the breastbone, and as broad as the palm of the hand of the patient on whom it is to be applied. Warm the strapping-plaster before the fire, and, fixing it at the backbone behind firmly to begin with, pull steadily and gradually, applying the plaster over the painful part, *i.e.* the broken rib, and finally end it off at the middle line in front. You will at once understand the advantage of this when you see that only one side is bound up; the other, the sound side, is allowed freedom to move with the breathing.

The Bones of the Upper Extremity which are most frequently broken are the collarbone, the bone of the arm, and the bones of the forearm, more especially the radius.

Fracture of the Collarbone, or clavicle, is an accident of every-day occurrence, and one to which it is essential to know how to render first aid.

For an account of the collarbone, its S-shaped curve, its position, and its likelihood of being fractured, see page 11.

It is a frequent accident in the football field and in the hunting field, whilst in the nursery it is not an uncommon occurrence when children are learning to walk.

The bone has to sustain the whole weight of the body when one falls on the hand; it may happen that both collarbones are broken at once.

When fracture does take place, it can be made out by applying the rules and tests laid down in page 50. Especially marked is the helplessness of the limb, the patient generally supporting the injured limb at the elbow with the other hand; deformity can be seen when the collarbone is looked at and compared with its fellow; and the gap or crack may be felt with the finger. On pushing up the elbow most of the deformity will disappear.

To prevent the end of the bone coming through the skin, *i.e.* compound fracture, or going into a blood-vessel, *i.e.* complicated fracture, it is necessary to fix the limb quickly and firmly. To effect this there are well-nigh as many means as there are doctors in the country; for "first aid" purposes, however, a speedy, sure, and safe method is the following: Place a pad in the armpit of the injured side; the pad may be a newspaper folded firmly, a handkerchief with a ball of worsted in it, a tennis-ball wrapped in a scarf, a lady's shoulder-wrap, a waistcoat folded to a square shape, and so forth. Place this in the armpit, pushing it gently but firmly upwards. Whilst this is held, apply a larger arm sling (see page 48), and finally tie the limb to the side as represented on next page. Were I to tell you other methods, it would only

confuse you when the time comes for application in real injury.

But, one naturally asks, Where is one to get triangular bandages on the hunting field? Well, a large handkerchief or neckerchief will do as well; but if that is not to be had, fix the arm to the side by a couple of handkerchiefs knotted together and tied round the body, including the arm; and turn up the tail of the coat or jacket over the forearm and pin it to the breast of the coat. Thus is a sling improvised which will serve to keep the limb quiet until you get something better. If the accident happens on the hunting field,

FIG. 31.—Bandage for broken collar-bone after Esmarch.

the patient should not be allowed to ride home, especially if it is the left clavicle which is broken. The patient should be taken to the nearest doctor in all cases, and most certainly should "his own doctor" be sent for when he gets home. You must not think, when you have rendered "first aid" in a case of fracture, that you can dispense with the doctor. Be as clever as you may at fixing a bone according to the instructions given you, and even should the doctor not want to touch it, which he will not if you remember and act upon the rules I have told you, still, for all that, there are other things to consider

when a bone is broken. The shock to the system will require attention; from this upset the patient may become the subject of any latent disease, such as gout, rheumatism, kidney disease, and numerous other ailments, which are much more likely to lead to serious trouble than the simple break of the bone. It is not knowledge, but ignorance, that makes people doctor themselves; and the most ignorant are in this, as in other things, the most ready to take upon themselves the management of even human lives. A man may ruin his own health—there is no law to stop him; but he ought not to be allowed to inflict hopeless ruin upon the health of others by his ignorant help.

The Bladebone (the scapula) is but seldom broken; when it is, it generally happens from a crush, or being hit by the buffer of a railway-carriage; it is not an uncommon accident amongst railway-servants. When it does happen, fix a bandage round the chest, just below the armpits, so as to embrace the bladebone, and apply a sling to support the arm.

The Arm-bone (the humerus) is frequently broken, and by a multiplicity of causes. The fact of its being broken can be established by a study of the signs and symptoms given at page 50. When broken at its upper end the signs may be obscure; but if, after a fall, the limb hangs helpless, and the patient complains of great pain on movement, then treat it as in fractured clavicle, by placing a pad in the armpit, tying the arm to the side, and putting on a smaller (not a larger) arm-sling, *i.e.* one folded twice.

When it is broken near its lower end, the fracture is usually perfectly apparent, and for this, as in the case of fracture of the elbow or forearm, make a splint of two pieces of stick crossed and tied together by a handkerchief, as represented at page 64. This splint is to be applied to the inside of the limb, and tied on with one handkerchief round the arm, another one, or two, round the forearm; and the limb is to be supported in a sling. Such a splint as this may be made of two pieces of wood—be they flat or round; of two pieces of cardboard; of two pieces of bonnet-

box; or of folded newspapers with pieces of wood, such as those used for lighting the fire, wrapped up in them to give fixity.

When the arm-bone is broken, and such a splint as this (Fig. 32) is to be applied, enclose the front, back and outside of the arm as well in a piece of stiffly-folded newspaper, or, instead of newspaper, a notebook applied open, or the straw casing used to pack bottles, such as champagne bottles, a piece of cardboard, or anything that comes handy. Supposing one is some distance away from assistance, a walking-stick may be broken in two, the ends crossed, as in Fig. 32, and tied together with a handkerchief, and applied to the inside of the arm as a splint;

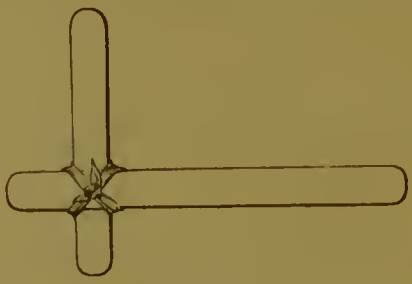

FIG. 32.—Improvised angular splint for fractures of upper limb (Author).

the coat-sleeve may then be pinned to the breast of the coat or dress, or the tail of the coat or jacket turned up and fixed as described at page 62. The bough of a tree may supply the place of a stick; two bayonets crossed, or the sheath and the bayonet crossed, may be tied together as in Fig. 32. That person must be stupid indeed who cannot in an open field, and away from everything, as the saying is, find a means of fixing a broken limb. If you can do nothing else, you can tie the arm to the side with handkerchiefs; and if even these are wanting, you can pin the coat-sleeve to the side—it is better than letting the arm dangle.

When a **fracture of both bones of the forearm**—the radius and ulna—occurs, there is usually not much difficulty in making out that the bones are broken. Almost all the signs and symptoms mentioned at page 50 are present.

To fix the limb, apply the splint delineated at Fig. 32, along the inside of the limb; in addition place a piece of stiff substance, such as a newspaper, matting, the straw casing of a bottle, a book with soft covers, or a piece of wood, along the outside of the forearm; and support by a sling.

Attend to the following injunctions when either the bone of the arm or the bone of the forearm are broken:—

1. Keep the elbow bent at a right angle.
2. Keep the thumb upwards towards the ceiling.
3. Fix in splints and support in a sling.

The rule in the upper extremity is to keep the elbow bent, in the lower to keep the knee straight. The objects are obvious. Should the patient recover with a stiff knee, the limb would be in a straight position and useful for progression, whereas a bent position would necessitate the use of a wooden pin to walk on. So with the upper limb: should the elbow recover fixed in a straight line after an accident, the hand could not be brought near the mouth; whereas in a bent position, with the thumb upwards, the hand can be used for feeding and for writing purposes, &c.

There is a special, very common fracture which occurs at the lower end of the forearm, in the bone that supports the hand, *i.e.* outside bone, or radius (see page 15). It is one of the most common fractures in the body, and goes by the name of Colles's fracture. It is peculiar inasmuch as it does not belong to any of the varieties of fracture previously mentioned. The cause of its occurrence is simple enough: a fall on the hand; and this bone which supports the hand—the radius—may snap through just above the wrist. Before the broken ends of the bone can escape from each other they are driven the one into the other, so that they are firmly fixed or impacted. This is called an *impacted* fracture. It may occur in other parts of the body, notably the neck of the thigh-bone. It is evident that all the signs given at page 50 will not be present in this form of injury. When it occurs, there will be pain and some deformity, but it will require skilled medical examination before it can

be made out. The treatment is to fix the limb as comfortably as possible in splints, as described for the arm and forearm, apply a sling, and take the patient to the nearest doctor. When a **finger-bone** is broken, apply a stick, or a piece of kamptulicon, along the palmar or front face of the finger, and fix with strips of your handkerchief or a piece of plaster.

Still another fracture of importance to be mentioned is—

Fracture of the Lower Jaw.—The lower jaw-bone is apt to get broken by a blow, a kick from a horse, a fall on the chin, &c. When it is broken the fact is easily ascertained, as the signs of fracture (see page 50) are evident. The mouth cannot be closed, the teeth are uneven, blood escapes into the mouth, the gap can be felt outside, and the grating, crackling, or crepitus can be felt on the least motion. Nature has provided a splint to which to bandage it, namely, the upper jaw, against which it naturally lies. To fix it, tie a handkerchief round below the jaw, cross the ends on the top of the head, and tie below the chin; a second handkerchief carried round the front of the chin to the back of the neck and there tied will secure the jaw firmly (see page 48, Fig. 25). Consult the doctor as to the means of feeding the patient and further treatment.

The Management of the Clothing in Street Accidents.—Your greatest difficulty in street accidents of the nature of broken bones or cut arteries is to know what to do with the clothing. Authorities on "first aid" say you are to rip up the clothing. Now this takes time; even with a sharp knife or scissors it takes you more time than you would care to spend, if it is a case of bleeding from the top of the thigh or armpit. The rule is, when you can make out what is the matter—say a broken leg or arm, or even have strong conviction that a bone is broken—do not pull the leg about by ripping up the clothing, and perhaps making the accident compound, but fix your splint outside the clothing, and *proceed as if the clothing were off.*

In the case of bleeding you can compress all the vessels above the clothing easily, except the artery behind

the collarbone and the artery at the fold of the groin. Unfortunately, it is when these two have to be compressed that most speed is required, owing to the large size of the vessels wounded. If you wait until the clothing is slit up, the patient will have likely bled to death, so you should proceed as follows :—For the artery of the thigh press your thumbs at once (as directed, page 30, Fig. 8) on the region of the artery above the clothing, and let others slit it up In a man or boy the compression can be done above the clothing when the patient is laid down flat. In the case ot a female it is impossible, but a wound of the artery high up in the thigh in a female is an extremely rare accident.

To compress the artery behind the collarbone, for a wound of the artery in the armpit, at once tear off the collar and scarf, and get your thumb in "the bird's nest," over or under the shirt, according as you can get it off or not. Let others then slip the clothing off.

Broken Back.—If the spine is broken, say in the middle of the back, the spinal cord (see page 18) is apt to get torn. The consequence is easily understood now that you know the relation of the spinal cord and nerves to the motion and sensation of the body, and to the backbone itself. In the case we have cited all sensation and motion would be lost below the spot where the rent of the cord has taken place —that is, the part below would be paralysed. The danger from the backbone being broken is not so much on account of the mishap to the actual bones as it is to the parts contained within. When the patient cannot move the lower limbs after a cart-wheel has gone across his back, you may come to a pretty safe conclusion as to the real facts. If, then, it be important to attend to a person where he falls in other cases of fracture, it is more important a hundredfold in such an accident as this. In fact the patient should not be moved, if you can help it, until a doctor is fetched ; but if it is impossible to get a doctor within a reasonable time, you must take great care to keep the patient's body rigid by poles, broom-handles, rifles, and such like, fastened on either side of the body. Beneath him a blanket or sheet should

be half slipped, half dragged, so as to be spread beneath him from shoulders to heels without moving his body.

When raised on the blanket or sheet by four people lifting at the four corners, pass a shutter (or stretcher, if you can get one from the police or hospital or ambulance station), under the patient, laying blanket and all on the stretcher. He can then be carried in safety. When the fracture is high up in the neck, the patient dies at once from a broken neck, as it is called. This is because the nerves to the midriff, or diaphragm, the muscle essential to breathing and consequently to life, receives its nerve supply by two nerves, the phrenics, which come off high up in the neck. Their influence is stopped; hence the diaphragm ceases to act, and death instantly ensues.

Having told you the meaning and nature of an injury to the spinal cord by a broken backbone, I must now explain

Injuries to the Brain.

1. **From Fractured Skull.**—The limits of the brain have already been given at p. 16. It is there stated that the position of the brain is limited by a line drawn from where the hair joins the nape of the neck, forwards and along the side of the head, and across the ears to the eyebrows. All above that line contains brain, and the brain is contained in the cranium. Any blow or fall on the head is apt, therefore, to cause a piece of *bone* to be depressed, to press on the brain, and to cause **compression.**

Compression may also come from *blood* pressing on the brain, and this condition arises thus. When a severe blow on the head is received, the rupture of a blood-vessel within the cranium may occur. The blood escapes from the artery and gradually accumulates between the bone and the brain. It may accumulate in such quantity—after, say, twenty minutes or half an hour—that it will press upon the brain, and cause compression just as surely as does a piece of bone. Compression may thus arise in two ways: the one, from bone, comes on immediately; the other, from blood, comes

on after the blood has had sufficient time to collect, say twenty minutes, during part of which time the patient may have been stunned. How to recognise compression of the brain :—

1. The patient is insensible.

2. There is loud snoring, called stertorous breathing—this is caused by the soft palate being relaxed and flapping backwards and forwards in the throat ; the muscles of the larynx are relaxed ; the cheeks are puffed out and dragged in between the jaws during expiration and inspiration respectively.

3. The eyeballs are insensible to touch. This marks deep insensibility, as you might expect, when the tender eye, in which a speck of dust cannot alight without your becoming aware of it, allows you to touch it.

4. The pupils of the eyes become insensible to light. The pupil of the eye is the black circle in the centre of the eye, situated in the middle of the blue, grey, brown, or black iris. The pupil in health is contracted when in a bright, and dilated in a shaded, light. The degree of insensibility can be partially judged when, by holding a candle before the eyes, or opening the eyelids in bright sunlight, it is observed whether the pupil contracts or not. If it does not, or but slowly and imperfectly, then is the injury to the brain great and the insensibility deep.

5. The hand placed over the heart, or the finger placed upon the pulse at the wrist (page 37), will indicate a slow action and a threatening to stop.

This condition might be mistaken for apoplexy or drunkenness. The mistaking it for apoplexy would not signify, as the treatment of the two conditions is well-nigh the same, and the history of the fall would settle the question (see Apoplexy). The mistaking it for drunkenness may be more serious (see Drunkenness). When there is any doubt, give the patient the benefit of it, and treat him, not as a drunken man, but as one having met with an accident.

What is to be done in compression ? Send for a doctor at once. In the meantime—

(*a.*) Place the patient in such a position that the air may readily enter his nose or mouth, and wipe the mud, or froth, or blood from off his nose and mouth.

(*b.*) Undo all tight clothing about the neck; undo the neck-cloth, shirt-stud, braces, waistcoat, and anything too tight around the waist.

(*c.*) Keep the head up in a line with the neck and shoulders, in the position of repose. You must beware how you hold an insensible person's head up; unless you notice what you are doing, you will find that the head is bent so that the chin is on the chest, and the patient well-nigh, or actually, suffocated from your want of attention. Again, you may, by passing your hand behind the lower part of the neck, in the endeavour to raise the shoulders, allow the head to fall back, and your attention is recalled by the gurgling sound in the patient's throat. The patient must be in a position to breathe easily.

(*d.*) Keep the windows open if it is in the house you are attending to an insensible patient; if in the street, endeavour, but you won't succeed, to keep the crowd away.

(*e.*) Apply cold water, or ice if you can get it, on a handkerchief or sponge to the head. This is most likely to do good when blood is escaping; but do it in any case, as you cannot be sure as to what has happened.

When the patient is taken within doors, take off the boots and apply mustard leaves or a mustard plaster to the soles of the feet.

II. A more common accident to the brain is one in which the patient is said to be **stunned** or **concussed.** This is brought about by a severe blow on the head, causing the brain to be so shaken that its workings stop, and the patient becomes insensible. As when you drop your watch, sometimes the glass is broken, at other times the works stop—so with the brain and skull, sometimes the bone is cracked, at other times the works stop. In simple concussion no real injury may have been done to the brain. It is only temporarily deranged; it will go on working by and by.

How can you recognise concussion?

(*a.*) There is the fact of a blow—a fact made evident, it may be, by a bruise or cut.

(*b.*) The patient is insensible.

(*c.*) The breathing is so quiet that you have to listen carefully, or put your hand on the chest to make out the rise and fall of the chest. This is very different from the loud snoring in compression.

(*d.*) The heart and pulse are disturbed, so that you get a flickering, fluttering beat.

(*e.*) The pupils may, on pulling the eyelids up, be seen to contract to light, or remain fixed, according to the depth of the insensibility.

The unconscious state may last from a few seconds to many minutes, or even hours.

Of course, in all injuries to the head, such as compression from bone, or rupture of an artery leading to effusion of blood, concussion will play a part—that is, the brain will be shaken. When the insensibility is from depressed bone, the symptoms of compression will come on at once, and drown those of concussion. When, on the other hand, the injury results in effusion of blood, at first there are symptoms of concussion, which after a few minutes may disappear, consciousness may return, the patient be able to tell his name, and whilst he is speaking and insisting on going home, the blood, which all the time has been slowly accumulating, may have gathered in such quantity as at the end of twenty minutes to press on the brain and cause compression. The train of symptoms from first to last would be—(1) insensibility, with placid breathing—concussion; (2) consciousness; (3) insensibility, with loud snoring—compression.

This paragraph will require reading again, as it is a summary of the facts of the few previous pages.

What is to be done when a person is stunned or concussed?

Send for a doctor—but in the meantime:

(1.) Place the patient in an easy position to breathe.

(2.) Undo all tight clothing everywhere.

(3.) Keep the windows open, if in the house.

(4.) Attempt to keep the crowd off, if out of doors.

(5.) Smelling-salts to the nose will do no harm, nor tickling the nose with a feather; but the brain will not go on working again until it has settled down from its shake. The application of cold water to the head may be advantageous.

Shock.—By shock to the system is meant the physical condition that a person is thrown into after a severe accident. It matters not how slight the accident, still is there a slight shock to the system; a rap on the knuckles, a barked shin, burning the finger whilst lighting a match, will each and all give rise to slight shock. If, on the other hand, the injury be severe, then is the shock great; a broken leg, a severe burn, a blow on the abdomen, will one and all give rise to severe shock.

Supposing a man pitched off his van, and you find him in the street or the side of the road with a broken leg. The first thing you will notice is, that he is shivering, and seems cold, even although it be twelve o'clock on a hot day in July. You will also find that the man is sensible; he can tell you how the accident happened, and he *tells* you he is cold; you see there is nothing wrong with his brain; it is his leg that is injured, not his brain. When you put your hand upon him, his skin feels cold. This is, then, a characteristic feature in shock, namely, a lowering of temperature. The temperature of the body in health remains pretty constant, falling a little in the early morning, rising a little in the early evening, but practically it is at what you see marked on the ordinary wall thermometer as "blood heat." When you read off the number on the thermometer scale, you will see that blood-heat stands opposite 98°, and that is about the average temperature. In fevers the temperature goes up to say 105°, or even 110°; but in the condition we are speaking of, shock, it falls to, say, 95°, or even 92°.

Here, then, is the indication of your treatment of shock,

viz. to prevent the man dying of cold. So in this and in all accidents your attention must be directed not only to fixing the broken leg, but also to keeping the patient warm. To do this, throw any wrap you have with you, or can obtain from the bystanders, over the patient. Get a blanket from the nearest house, if you can ; but if you can get nothing else, divest yourself of your coat or shawl, and throw that over him.

When you get the patient under shelter, throw a warm blanket or blankets over him. He will stand two or three. Give him some hot tea, coffee, or milk, or a small quantity of hot whisky and water. Get ready hot bottles to apply to the feet, and in every way you can, consistent with common sense, keep the patient warm. You will in this way prevent the body heat falling too low, and so render recovery possible.

Fits.—It may be impossible to prevent fits coming on, but it is possible, once they have come on, by intelligent and common sense rules, to prevent more serious consequences ensuing.

There are many forms and varieties of such diseases, but only the more common will I tell you of. There are three chief forms :—

I. **Epileptic Fits.**—The disease, which in ancient times was called being possessed by a devil, is in modern times called epilepsy. It is characterised by a sudden seizure, in which the patient gives usually a cry or shriek, and, falling down, goes through a series of twitchings and contortions of limbs, body, and features, caused by muscular spasm. The muscles move the jaw and the tongue, but these do not keep time in their actions, and the tongue gets caught between the teeth and bitten. It is not that the patient bites the tongue in agony, it is only that the tongue gets as it were accidentally caught between the teeth.

Treatment: You cannot shake the patient out of the fit, you can only, *whilst the fit is on* :—

1. Undo all tight clothing about the neck.

2. Place the patient in the position of repose, so that the breathing is in nowise hampered.

3. Prevent the tongue being bitten by placing a cork, the handle of a pocket-knife, a pencil, a piece of india-rubber, or your handkerchief twisted, between the teeth.

4. Restrain the struggles, but do not tie the patient down or put heavy weights on his limbs, so as to violently oppose the spasm.

5. Take care that the patient does not hurt you or him- or her-self whilst struggling.

6. *After* the fit allow of three or four hours sleep. The fit is only the expression of the diseased condition, medical advice will have to be sought, and that too for a lengthened period if any permanent good is to be done.

Every one subject to epileptic fits ought to avoid alcohol, to shun dangerous places, such as the edges of pits, cliffs, and so forth, and should never if possible be alone.

II. **Fainting Fits** come from the effects of a close room; tight lacing; fright, as at the sight of blood; good or bad news of an affecting nature, and so on. The fit comes on generally with a feeling of giddiness and fluttering at the heart; the face becomes deadly pale; the blood deserts the lips; the patient becomes insensible and tumbles down. Supposing you are sitting in church, and you find the person next you *going off* into a fit, you should at once bend the head low between the knees. Supposing the person has gone off into a dead faint, and the first thing you hear is the head thump against the pew, then lay the patient down *flat* on the seat. When I say *flat*, I mean flat; so make no mistake. Do not raise the head, but rather let the head be below the level of the body over the end of the seat. Fussy people will raise something, it is in human nature to do so; well, let that fussy person raise the *heels*, it will do some good. Now the object of pressing the head between the knees, or laying the patient down flat, or even with the head below the level of the body is to get the blood to go to the brain; and so by getting the head on to a level with or even below the heart, it is fairly

to be expected that the blood will circulate more freely in the brain. When the circulation is restored, the patient will recover affrighted, but not seriously worse for the short spell of insensibility. The patient should, when sensibility is restored, be removed into the open air—at any rate out of the place where the faint occurred; otherwise, the same conditions obtaining, the faint may come on again. Smelling salts applied to the nose may ward off a faint, or may help to bring the patient round when insensible. A draught of cold air in the face, or smart sprinkling with cold water may cause the patient to breathe, and so cause the blood to circulate freely. Cold air is very likely to do good, as it was coming suddenly into contact with the cold air which made us take our first breath, and we have gone on breathing ever since.

III. **Hysterical Fits.**—Hysteria is a disease which exhibits itself in the form of more or less frequent fits. These fits are peculiar: the patient (a girl generally) never faints by herself; she never falls to hurt herself; and she can have these fits when she pleases. The fit is known by its violence—by kicking, screaming, howling, tearing, biting, and such-like acts. The eyelids twitter and blinter, and the parents of a hysterical girl generally regard this as a sign of fearful import. She is blintering to see what the bystander means to do; if it happens that the bystander knows what to do, the girl will soon recover when she finds the necessary steps are being taken. The steps are, pouring a jug-full of cold water slowly on the head, or dashing a tumbler-full of cold water sharply in the face. This, with some *un*sympathetic talking to, will likely suffice to bring her round. Not a bad plan is to go out of the room, slam the door, and make the patient believe you are gone away. Quietness will soon ensue, and the fit will go off if you make no noise whilst outside the door; but if the patient knows you are there, the fit will not stop, but only continue in its intensity. Medical advice must be sought before the disease is cured.

Bite from an animal.—We are more often in this country

bitten by dogs than by other animals, but it matters not what animal bites one, be it a horse, a snake, or a man, the same rules apply in every case. It matters not whether the dog is known to be mad—that is, rabid—or not, you are to proceed as if it were. It is most dangerous to get bitten on the hand and face, not that there is anything peculiar about these parts, but that they are the only parts not covered by clothing. The dog's teeth are not the poison, it is the fluid, the saliva, which is on the dog's teeth, which when it gets into the blood may set up hydrophobia. The teeth, in other parts than the face and hand, get wiped as they pass through the clothing and go in clean and possibly freed from the rabid poison.

Supposing the finger bit at its point, proceed as follows: (1) At once grasp the finger above the wound, between the fore-finger and thumb of the other hand; (2) suck the wound; (3) rush to the water-tap and let water flow over the wound, but do not relax your grasp on the finger; alternately suck and wash for five or ten minutes, or, better still, dip the finger in warm water instead of cold, it will encourage bleeding and thus help to expel the poison out of the wound. (4) If you know the dog to be mad, you should tie a string round the finger above the wound, *i.e.*, between the wound and the heart, when you can relax your grasp with your finger. Go to a doctor and get him to cauterise it for you, and then act afterwards as he directs. Supposing one is far away from a doctor or chemist, one may cauterise by a red-hot wire, or by pushing a lit fusee or vesuvian into it. Sportsmen in India have been known, when bit by a snake, to pour gunpowder on the part and explode it.

THE STING from a bee or a wasp is to be treated in the same manner. You pick out the sting when you see it.

Notice that any of these poisons may be sucked with impunity, if you have no crack or abraded part about the mouth; besides, one does not swallow the poison after sucking.

If, of course, one is bitten or stung in other parts besides

the finger—if it is the hand that is bitten, tie a handkerchief tightly round the wrist, and then proceed as before; if it is the face you must dispense with the bandage and trust to sucking, &c. Whenever you can, you tie a ligature between the wound and the heart, suck, wash, and cauterise, and go to a doctor speedily. The object, instantaneously it must be, of tying a band between the heart and the wound is to stop the passage of the blood in the part, and so prevent the veins carrying the poison away into the circulation.

A mad or RABID dog suffers from a disease called RABIES. The poison is present in the saliva, which when it finds its way into the blood of man causes the disease called hydrophobia. A rabid dog is a diseased animal, and looks and behaves as though he felt ill and nervous; his coat is out of condition; his ears hang down; his eyes are red; he has a slouching gait; his tail has a droop instead of a curl upwards; he is nervous about crossing the street, and hesitates to leave the railings and the doorways; he avoids sunlight, and gets into the dark places in a room. The saliva dribbles from his mouth, and he has a spasmodic action in the muscles of his jaw. This causes him to snap at things without meaning harm, as it may even be a door scraper he gets hold of; and if you put down your hand to pat him he may, instead of licking, bite it. A friend attempting to pacify the animal gets served likewise; this will cause an alarm to be raised, the neighbours will collect, the dog becomes scared, frightened and provoked, is hunted with brooms and pitchforks, and is driven raving mad. This is the state we read of in the newspapers, and people imagine that all mad dogs behave like the "newspaper dog." The above description will show that far other is the case, and that a rabid dog may be quite quiet or quite harmless if not tormented or tampered with. Beware of dogs then which, in the hot weather, look out of condition and have a frothy saliva dribbling from their mouths; do nothing to provoke them, otherwise serious consequences may ensue.

Apoplexy—This is a disease much dreaded and often

talked of, and one which seems now to occur in younger people than formerly. So far as we are concerned it is only with the apoplectic fit or seizure we have to do. The disease consists in the escape of blood on the brain from a broken blood-vessel. As we get older our blood-vessels, instead of remaining the soft elastic tubes they were in youth, become more brittle from lime-salts deposited in their walls; they are said to become bony. This inelastic narrowed condition of the vessels gives a great deal more work to the heart; consequently the heart, being a muscle, gets bigger, as other muscles do when much used. This big heart, thumping away against a diseased vessel, may, when extra work is thrown on it, as running, cause the vessel to crack and allow of the escape of blood. This may occur anywhere in the body, but when it does so in the brain it causes apoplexy.

In a well-marked apoplectic fit you would expect to find the symptoms of compression (page 69). There would be —(1) Insensibility beyond the power of rousing. (2) Loud snoring respirations—stertorous breathing. (3) The face would be flushed and congested. (4) The pupils possibly unequal, not responding to light. (5) The heart would be beating pretty strongly; that is part of the cause of the trouble that the heart is too strong. (6) The limbs upon one side of the trunk would be more limp than the other, pointing to which side is affected. It may be also that the temperature of the body is higher. (7) Usually the person is getting on in years.

Treatment: (*a*) Undo all tight clothing everywhere; (*b*) place the patient in an easy position to breathe; (*c*) open the windows, and pull the curtains of the window or bed well back if it is in the house, if in the street keep the crowd away; (*d*) keep the head up, with the precautions given at page 70; (*e*) apply cold water to the head on handkerchiefs, flannels, or sponges, or tie an ice-bag on the head. (*f*) Put hot-water bottles, mustard-leaves, or a mustard plaster, to the soles of the feet. If the doctor is far off, put one drop of croton oil, if you can get it, on a small lump of sugar

and insert it between the teeth. This may, by causing purgation, do some good. Never give any fluid by the mouth when a patient is insensible from any cause; in particular, guard against stimulants being given in apoplexy. For the differences between alcoholic poisoning and apoplexy, see page 89.

Burns and Scalds.

Burns are caused by hot solid substances, or by flames; scalds are caused by hot fluids. A burn or scald may vary between a slight redness of the skin and complete charring of the tissues. Supposing a kettleful of boiling water to tumble over a child's foot, you would get off the shoe or boot as quickly as possible, cutting the elastic and leather, or cutting the lace and leather, if need be. You would then cut off the stocking along a dry part if there is one, so as to avoid sending your scissors or knife into the burned part. You must on no account *drag* the boot or stocking off, otherwise you will strip bare the injured part. When you see the part, there may be a big bleb or blister there; do not prick it, leave the doctor to be the judge of whether this should be done or not; but immediately place the limb in *warm* water, that is, water of the temperature of your own hand, or elbow. I tell you warm water, because that will be likely the fluid most quickly obtainable, especially if, as in this instance, there be any left in the kettle; the water excludes the air, is comforting if it is warm, and takes the pain away better than anything. Now get some oil—linseed oil, olive or salad oil, cod-liver oil, almond oil, *not* mineral oils such as naphtha or paraffin; and if you or your neighbours have any lime-water, take equal parts of oil, say linseed oil, and lime-water, and, mixing these together, you will get a thick honey-looking fluid, called carron oil. Into the oil, either plain or with lime-water, dip strips of soft rag or lint, and, taking the limb out of the warm water, apply the rags so as to completely cover the burnt part. Over this apply a thick layer of cotton wool, if you have got it, or flannel if you have not, and secure by gentle pressure with a bandage

or handkerchiefs. Place the patient with the limb in an easy position on a bed or couch, and send for the doctor, if you have not already done so. Instead of oil, one may use flour, common kitchen whiting, prepared chalk as used for tooth powder, either dusted on, or, better still, made into a paste, and then gently applied with a brush or feathers, making a covering about ¼ of an inch thick. If the pain is great, a strong solution of carbonate of soda in water may relieve it. Do not administer opiates if you can get a doctor within a reasonable time; but you should give the patient hot fluids to drink as he is suffering from shock, and requires in addition to the relief of the burnt part to be treated for shock (page 236). A person when burnt suffers not from high temperature, but from cold and chill, shock in fact, hence the necessity of immediately applying heat internally, and warm covering without.

If it is a burn, and part of the clothing is charred and stuck to the skin, do not drag it off, but take a scissors and cut the clothing off, leaving the part adherent to come off as it will. Otherwise the treatment for burns and scalds are practically the same. Take particular care of even slight burns on the throat and below the chin, such as occur when the clothes catch fire.

The Apparently Drowned or Suffocated.—When a man—of course it may be a woman or child—who cannot swim, falls into deep water, he generally rises once, twice, or thrice to the surface, and struggles to get a gasp of air or a grasp of anything near. The state of intense alarm causes forgetfulness, and an attempt is made to breathe below the water; the consequence is, water gets into the air passages and he becomes asphyxiated and insensible. Should he be pulled out of the water in time he may be restored by some one of the methods of artificial restoration. What do you mean by "in time"? In the first place it will be impossible to get a correct notion of the time he has been in the water from the bystanders: to some it will appear a long time, say twenty minutes; to others it may seem only five; so that

people may differ as much as fifteen minutes as to the time any person has been in the water. If it is an absurd time, say over half an hour, it would be useless to attempt to restore life; but if there is a difference of opinion as to whether it was five minutes or fifteen minutes, begin to try to restore life at once. The directions given by the Royal Humane Society are here incorporated under the heading of the Sylvester Method of Restoring the Apparently Dead. There are other excellent methods, and chief amongst them, and by many preferred to the Sylvester method, is that of Dr. Marshall Hall. This is the best method if no assistant is at hand. It is performed by alternately rolling the body on its face to compress the chest, and on its back to allow the elasticity of the ribs free movement to draw air into the lungs The pressure of the hand over the lower ribs whilst the body is on the face, helps the process of expiration. Another excellent method is that of Howard; but I am afraid that by telling you too many methods you will get confused by their complexity.

The Sylvester Method of Restoring the Apparently Dead, recommended by the Royal Humane Society.

If from drowning, suffocation, or narcotic poisoning:

Send for medical assistance, blankets, and dry clothing, but proceed to treat the patient *instantly*.

The points to be aimed at are—first, and immediately, the restoration of breathing; secondly, after breathing is restored, the promotion of warmth and circulation.

The efforts to restore life must be persevered in until the arrival of medical assistance, or until the pulse and breathing have ceased for an hour.

Dr. H. R. Sylvester's Method of Restoring Natural Breathing.

Rule I.—To adjust the patient's position. Place the patient on his back on a flat surface, inclined a little from

the feet upwards, raise and support the head and shoulders on a small firm cushion or folded article of dress placed under the shoulder blades. Remove all tight clothing from about the neck and chest.

RULE II.—To maintain a free entrance of air into the windpipe. Cleanse the mouth and nostrils, open the mouth; draw forward the patient's tongue, and keep it forward. An elastic band over the tongue and under the chin will answer this purpose.

RULE III.—To imitate the movements of breathing:

First. Induce inspiration. Place yourself at the head of the patient, grasp his arms, raise them upwards by the sides of his head, stretch them steadily but gently upwards, for two seconds.

[By this means fresh air is drawn into the lungs by raising the ribs.]

FIG. 33.—Inducing Inspiration.

Secondly. Induce expiration. Immediately turn down the patient's arms, and press them firmly but gently downwards against the sides of his chest for two seconds.

[By this means foul air is expelled from the lungs by depressing the ribs.]

Thirdly. Continue these movements. Repeat these

measures alternately, deliberately, and perseveringly, fifteen times in a minute, until a spontaneous effort to respire be perceived.

[By this means an exchange of air is produced in the lungs, similar to that effected by natural respiration.]

When a spontaneous effort to respire is perceived, cease to imitate the movements of breathing, and proceed to induce circulation and warmth (as below).

FIG. 34.—Inducing Expiration.

RULE IV.—To excite respiration. During the employment of the above method, excite the nostrils with snuff or smelling salts, or tickle the throat with a feather. Rub the chest and face briskly, and dash cold and hot water alternately on them. Friction of the limbs and body with dry flannels or cloths should be had recourse to. When there is proof of returning respiration, the individual may be placed in a warm bath, the movements of the arms above described being continued until respiration is fully restored. Raise the body in twenty seconds to a sitting position, dash cold water against the chest and face, and pass ammonia under the nose. Should a galvanic apparatus be at hand, apply the sponges to the region of the diaphragm and heart.

Treatment after Natural Breathing has been restored.—*To induce Circulation and Warmth.* Wrap the patient in dry blankets, and rub the limbs upwards energetically. Promote the warmth of the body by hot flannels, bottles or bladders of hot water, heated bricks, to the pit of the stomach, the armpits, and to the soles of the feet. On the restoration of breathing, when the power of swallowing has returned, a teaspoonful of warm water, small quantities of wine, warm brandy and water, or coffee should be given. The patient should be kept in bed, and a disposition to sleep encouraged. During reaction large mustard-plasters to the chest and below the shoulders will greatly relieve the distressed breathing.

NOTE.—In all cases of prolonged immersion in cold water, when the breathing continues, a warm bath should be employed to restore the temperature. An emetic will do good.

How to remove a foreign body from the Eye.—Do not rub the part; you will only press the substance if it be sharp and hard into the eyeball, and thereby do much damage.

Take hold of the upper lid and pull it forwards, and at the same time push up the lower lid inwards beneath the upper; let both go and allow them to rearrange themselves; the hair of the lower lid will brush the back of the upper lid, and may thus remove the foreign body. Do this once, twice, or thrice. This will usually remove the annoying smuts which find their way into the eye in a railway carriage. You can do it to yourself or others.

If you can get a basin of water, put your face into it and open and shut your eyes. Take a pinch of snuff if it can be got, the sneezing may help dislodgment. If none of these are of any use, pull down the lower lid and examine for the irritating particle on its inner side, if not there, examine below the upper eyelid. To do this get the patient to sit down, put a towel over the head, place the head back against your chest as you stand behind him; now press a penholder, or fine stick, or stout wire or the skin three-

fourths of an inch above the edge of the upper eyelid, and, pushing it back, seize the eyelashes of the upper lid, between the finger and thumb, and pull them forwards and upwards, everting the lid back over the penholder. You can thus examine for the foreign body and remove it if it is there. If you can see a piece of steel *fixed* into the clear part of the eye, drop in a few drops of olive oil, apply a little cotton-wool or sheep's-wool on the closed eyelid, and tie up with a handkerchief, exercising slight pressure on the eyeball so as to keep it quiet, and take the patient at once to the doctor.

To remove a foreign body, such as a pea or bead, from the Ear.—In the first place, if there is a doctor within twenty miles send for him ; meanwhile, do not touch the pea, nor allow the child to push its fingers into its ear, even tying its hands down to prevent it so doing.

If on board ship, with no doctor, pass the narrow blade of a pocket-knife above the foreign body, taking care not to press upon it whilst so doing ; rather wound the ear than touch the pea or bead. You should make up your mind to extract it at the first try, as each successive attempt further removes the possibility of getting it out. Instead of, and better than a knife, a wire with its extreme end slightly bent so as to make a tiny hook ; if available, a Waverley pen, with its bent-back tip, will suit admirably. The hook is to be passed above the pea or bead with the point of the hook towards it ; and when once passed over the foreign body it is simple enough to extract by tilting it out. Why you must be careful about this apparently little operation is that, if once the foreign body gets far in, inflammation of the brain may ensue.

To remove a foreign body from the Nostril.—Give a pinch of snuff or of pepper, so as to cause sneezing. Let the patient blow the nose violently ; or, blocking up the side where the foreign body is not, let the air escape forcibly by fits and starts from the nostril containing the body.

WHEN A NEEDLE BREAKS OFF after penetrating the skin,

the patient must be taken at once to a doctor to have it extracted. If on board ship, with no surgeon, cut down with a razor or sharp knife on the needle, and remove it with sugar-tongs if you have no other forceps.

Suffocation, or asphyxia, comes about in various ways: choking on a piece of meat; inhalation of smoke, as in a burning house; inhalation of poisonous gas, as from a charcoal fire with insufficient ventilation, or escape of coal-gas; swallowing irritating fluids, such as caustics or boiling water; this is also the condition induced in drowning.

When from a piece of *meat* choking up the air passages, the patient, whilst laughing or busily talking when the mouth is full, starts up from the table, turns blue in the face, attempts to pass the fingers to the back of the throat, and then drops down insensible. The bystander should at once open the mouth, pass the forefinger down behind the tongue, and attempt to dislodge the particle of meat. No half-measures will do; this must be done at once, and decidedly. If the piece of meat is removed, but the patient does not come to, perform artificial respiration (see page 82). If the piece of meat does not completely obstruct the air passages, there will be probably violent spasmodic cough, with much difficulty in breathing, and the patient points to the throat. Here also open the mouth and remove anything you can see or feel with the finger. Thump the back hard, bending the body at the same time well forwards. If it is a child, and death likely to ensue, hold it up by the heels and thump the back hard.

If the suffocation comes from *smoke or gas*, get the patient into fresh air, and perform artificial respiration (page 82).

A common form of suffocation in children is brought about by their attempting to drink from the spout of a kettle which contains boiling water. The reason of their so drinking is that the kettle is used frequently by the poorer classes to make tea in, and the child, when it gets its mother's back turned, wants to get a drink of tea. It is not likely that any of the water is actually swallowed, but

enough is taken to cause choking, cough, and suffocation from the swelling at the back of the throat.

Treatment: Send at once for the doctor, and whilst he is being fetched, wrap the child in a blanket, apply hot sponges or hot flannels, dry or moist, to the throat, and set in an arm-chair before the fire. As in scalds elsewhere, oil—linseed, salad, or cod-liver oil—may be given.

POISONING.

The subject of poisons is so large that it is possible to tell you only the most meagre details as to symptoms. The treatment I shall make as general as possible, so that you will have a simple, sufficient and safe guide.

Some poisons induce sleep; others cause delirium; whilst a third class cause destruction of the tender lining of the mouth, throat, and stomach. This classification, although not technically correct, will be sufficient to guide you in your treatment until medical aid arrives.

I. Those which induce sleep, called *narcotics*, contain essentially opium in some form. Laudanum, morphia lozenges, many cough lozenges, and a few of the better-known children's elixirs, such as paregoric, Godfrey's cordial, and Mrs. Winslow's soothing syrup, are types of the class.

The treatment is, the administration of an emetic (see page 88), and attempts to keep the patient awake. This is done by walking the patient about, slapping with a wet towel, and the administration of strong black coffee. Slapping the soles of the bare feet with a slipper is calculated to keep the patient awake.

II. Those poisons which produce destruction of the lining of the mouth, throat, or stomach are the strong acids and alkalies and some metals.

The *acids* most commonly taken as poisons are: 1, oxalic (the salts of sugar, salts of sorrel); 2, carbolic; 3, sulphuric (oil of vitriol); 4, nitric (*aqua fortis*); 5, hydrochloric (spirit of salt).

The *alkalies* most commonly taken as poisons are caustic

potash and soda. These poisons are called, collectively, *corrosives.*

Treatment: Send for a doctor. Do not give an emetic, but administer: 1, linseed or salad oil; 2, demulcent drinks, as barley-water. In acid-poisoning, give alkalies, such as a tea-spoonful of magnesia or chalk, if it is to be had; if not, scrape the ceiling, or give common kitchen whiting. In poisoning by alkalies, give acids; the most handy one is vinegar, the acetic acid in it counteracting the action of the alkali.

The metals most commonly taken as poisons are: 1, arsenic; 2, mercury (corrosive sublimate); 3, antimony (butter of antimony, or tartar emetic); 4, lead (sugar of lead); 5, phosphorus. These poisons are called, collectively, *irritants.* The symptoms would be pain at the pit of the stomach, retching, alarm, and metallic taste in the mouth.

Treatment: Send for the doctor. 1. Give an emetic. To do this, adopt one or other of the following methods: *a*, tickle the throat with the finger or a feather; *b*, give a tablespoonful of mustard in a breakfast-cupful of warm water; *c*, a table-spoonful of salt may be used instead of mustard, but the mustard is the better. *d.* If these have no effect, send to the nearest chemist, if the doctor is not to be found, and tell him to send an emetic.

2. Administer a couple of raw eggs, beat up, and if they are not to be had, milk or some strong tea.

It is safe to give oils in all cases except phosphorus poisoning.

III. The third class are those which produce excitement; chief amongst these are prussic acid and strychnia. The excitement induced is immediate, and all that can be done is to try to prevent a fit coming on by slapping the face or dashing cold water sharply in the face. Administer an emetic if the condition admits of it.

IV. Alcohol is the chief type of the class of inebriants. It is the treatment of collapse from drink only that requires attention. Frequently do we meet with a poor wretch huddled in a heap in a doorway, who is the subject of this

condition. The patient will be found speechless, motionless, insensible, and with a bloated countenance. The odour of the breath, the pallor of the face, the weak pulse, the slow snoring respirations, and the dilated pupil, may, collectively, decidedly pronounce this to be what we are discussing; but mistakes are so frequently made between this and other serious conditions, notably apoplexy, that you must always give the patients the benefit of the doubt, and take them to a hospital or a doctor instead of sending them, on your own responsibility, to a police cell.

When you are sure of the condition of your charge, and no medical man at hand, induce vomiting and prevent collapse by applying heat without and within.

Simple directions for the treatment of poisoning. —*On all occasions send for a doctor at once.*

A. If you do *not* know what the poison is—

1. Get mustard, eggs, flour, milk, and tea.

2. Administer a tablespoonful of mustard in a teacupful of warm water as an emetic. [You may also send to the chemist for an emetic in case the mustard should fail. The chemist will know what to send, either 20 grains sulphate of zinc, or 1 oz. ipecacuanha wine, for one dose.]

3. Have the tea being made ready for use.

4. Break two or three eggs into a basin, beat them up, and administer at once; or give a handful of flour beat up into a cream, with water; a cupful of milk will do some good, if neither of these be handy.

5. Vomiting will now probably come on, if it does not do so within ten minutes, repeat the mustard emetic, or give the emetic the chemist has sent, if it has come.

6. When vomiting has ceased give the patient a cupful of strong hot tea and put him to bed.

B. If you do *not* know what the poison taken was, *but find stains on the lips*—

N.B.—Do not give an emetic.

1. Give at once a wine-glassful of olive (salad or sardine) oil, linseed oil, cod-liver oil, castor oil, or almond oil (*not oil of almonds*).

2. Put the patient to bed, apply smelling-salts to the nose, if need be, and hot sponges to the throat if there are signs of choking.

C. If you *do know* what the poison is, I would advise you to proceed with the use of the simple remedies, and do not attempt to remember antidotes. Did I tell you them, you would forget when you came in a hurry to search your memory, say five years hence; and whilst perplexing your brain over, it may be, a useless antidote, the object of your care may have slipped through your fingers for want of a cup of milk.

Remember the following broad facts: *When a person has swallowed a poison and threatens to go to sleep, keep him awake; when he seems going off into a fit, dash cold water in his face; when there are no stains about the mouth, give an emetic, eggs, milk, or oils (except in phosphorus), and end up with tea; when there are stains about the month, give oils, but no emetic.*

Sunstroke.—The following is from Dr. Dawson Turner's pamphlet (Longman, Green and Co., London):—

Sunstroke comes on suddenly whilst exposed to the direct rays of a hot sun, but heatstroke may come on at night. In the first place take all sensible precautions against these, by wearing a good thick felt hat with a wide brim, or a pith helmet, such as our soldiers now wear in India, with a good broad flap of linen hanging down behind so as to guard the nape of the neck. Cover the hat too with white calico, and do not, if you can help it, expose the nape of the neck to the rays of a tropical sun.

In case you are anywhere where you cannot get medical aid, act as follows: Strip the patient of his outer clothes; lay him down with his head and shoulders a little raised, and give him a cold douche, and plenty of it, by pouring jug after jug of cold water, from the height of three or four feet, on the top of his head and down his spine; or better, apply an ice-bag, if you can get it, to the head. Sponge also his hands, feet, and chest with cold water. Keep him in a darkened room, and where, if it is to be had,

there is a nice cool draught, and let him lie perfectly quiet and undisturbed. If he seems likely to sink altogether, put a blister or a mustard poultice on the nape of the neck.

Frost-bite.—Take great care not to bring the patient into a warm room or near a fire ; or the most dreadful consequences may ensue, such as the loss of a limb, mortification, and so on. Rub the part affected, with snow in a cold room, and then bathe with ice-cold water, or lay bits of linen on the part soaked in ice-cold water ; thus let the circulation be slowly restored. After a time give a little cold weak brandy and water.

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